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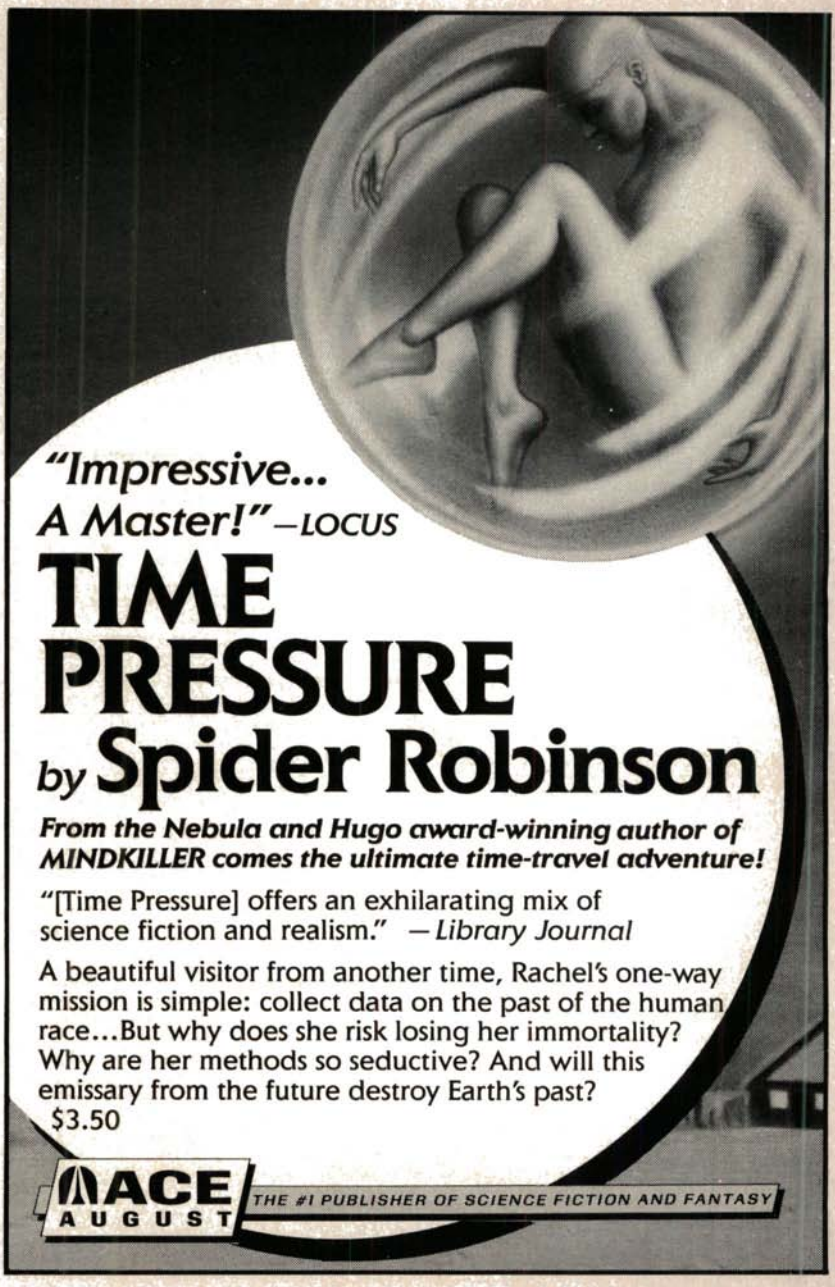
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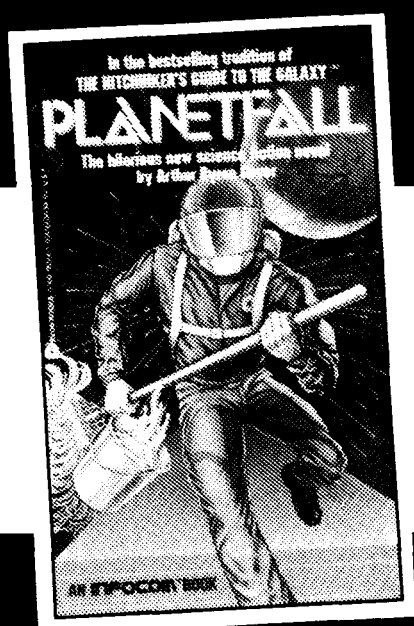

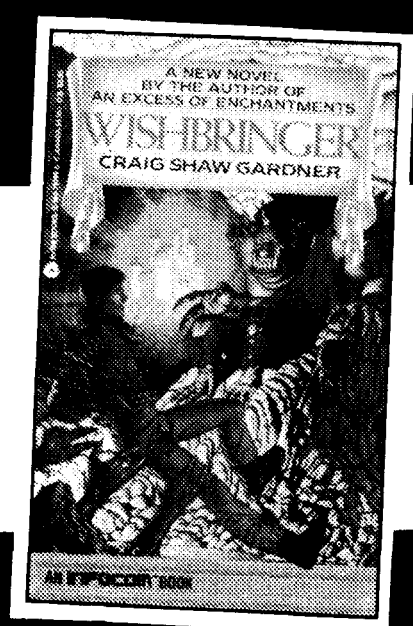

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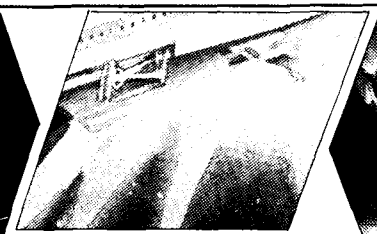

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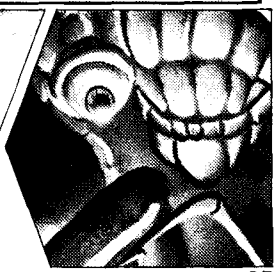

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Editorial

PURE ART AND ELECTRONICS

Stanley Schmidt

Last month, as on several previous occasions, I mentioned that one of the few philosophical precepts consciously maintained by *Analog* is that virtually anything is open to question. Today I let that principle strike very close to home by raising a question I recently heard posed by a young man at a convention: "Why have editors at all?"

Art, he suggested, is supposed to be self-expression; and editing, if not outright censorship, is at the very least interference with that self-expression. Why should an editor decide what is and is not worthy of publication, or tell a writer that his work should be changed to something other than what he originally wanted it to be?

There are two distinct questions here, both of which I have dealt with at some length in at least three previous editorials. I return to them now not because the young man's question has filled me with an urgent compulsion to defend my existence (or at least my profession), but because we are beginning to see big, important changes in the answers.

To review the old answers briefly—the first question is why an editor should select what is and isn't published. Actually, no single editor does quite that. At most, he decides what is and isn't published *by the particular publication he works for*. In principle, at least, the author whose work is rejected by one editor is always free to offer it to another—and, if he runs out of editors without finding a taker, to publish it himself. It's true that that will cost him,

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but if somebody else publishes it, that's going to cost, too. The Constitution guarantees the right to write what you want; it does *not* guarantee the right to have somebody else publish it at his expense. Any publisher *has* to make choices of what to print, because no publisher could possibly print everything offered to him. If a publisher's reputation and future prosperity are going to be determined largely by his choices, you can hardly blame him for wanting to choose those things which he will be proud to have his name associated with and which will attract enough of an audience to generate a decent return on his investment.

The other question, why an editor should suggest changes and why a writer should consider making them, relates more directly to that "pure art" concept. No doubt there is a place for pure art in the sense of self-expression completely untouched by anybody's interests or preferences but the author's—but often that place is in a diary, which nobody but the author is expected to read. As soon as more than one person is involved, a new principle applies: it ain't art till it communicates. If a writer is trying to "express himself," and readers can't figure out what he's talking about, or why, something needs to be done. Part of an editor's job is that of matchmaker, trying to bring together writers and readers with common interests—but after he has them together, he also has to make sure the lines of communication between them are functioning.

Another way to look at what an editor does, from a reader's viewpoint, is that he acts as a filter, screening a larger flow of potentially interesting material than the reader could get through alone to pick out those parts of it likely to be of *most* interest. But a filter is another name for a selective barrier, and both readers and writers must sometimes find it disturbing that editors, in the process of picking things most likely to interest their readers, may sometimes block others that readers would like but never get a chance to see. I cannot deny that this happens; some of us have had personal experience with it, and probably everyone has heard more or less true stories about it. Until recently, I would have had to say that that was an unfortunate but unavoidable side effect of the filtration process. Some form of filtration is needed; there is far more information circulating than any person could hope to wade through. Very few of you would be willing or able to get through the 500 or so science fiction stories I read in a month to find half a dozen I think you'll like—and science fiction is only one of many things that interest you. So you hire me to find good stories for you, and I have to do it a pretty good percentage of the time or I'll lose you as a reader. But I have a fixed number of pages to fill every month, and sometimes I see things that at least some of you would like a lot but I just don't have room for. Some of them find homes in other magazines or anthologies, but there are only so many of those and some don't. I sincerely regret that you don't get to see those, and that the people who wrote them don't get heard.

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The basic problem is the fact that the space available for publication, and therefore the amount of material that can be published, is limited. But what if that limitation were removed, or at least greatly reduced?

Until recently, the idea would have seemed a wild flight of fancy. Now, however, it's not only beginning to look very possible—it's already happening.

The key, of course, is computers. On one level, the plunging costs and wide availability of personal computers with sophisticated graphics capabilities have made paper publishing easier than ever before. Somebody with even a fairly modest computer and budget can now run off enough copies of something he's written to get it before an audience of some size. He'll still be plagued by the problems of physically distributing all that printed paper—but paper is no

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THE
TEAM SPECTRA
REPORT

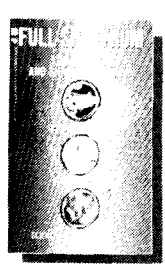
So, anyway, we were sitting in this great Chinese restaurant on West 54th Street called Imperial Dragon (where else would a bunch of science-fiction editors go?) and the conversation got around to the future of Spectra. In our ultimate publishing fantasies, we were asking, what kind of writing would we like to see more of? Well, each of us have specific sub-genres that interest us more than others, but all of us at the table agreed that we reserved our greatest affection for the kind of science fiction and fantasy that breaks new ground, that tells a story that hasn't been told a million times before. The kind that makes you sit back and wonder for a while.

By the time the Crispy Orange Beef arrived (stunningly prepared, big chunks of beef with wispy curls of orange rind), we had decided that we needed a new forum in which to declare our definition of the "state of the art." Almost as immediately, we decided that this forum should be an enormous original anthology and that it should be called **Full Spectrum**. So we announced our intentions to the community, the stories began to arrive and a year later we were very proud of the results.

Full Spectrum includes twenty-five stories and nearly 200,000 words from some of the most brilliant writers working in our field today. There are plenty of names you've heard before, such as Gregory Benford, Thomas M. Disch, Lisa Goldstein, Richard Grant, Nancy Kress, Jack McDevitt, James Morrow, Pat Murphy, Lewis Shiner and Norman Spinrad. There are several names you've heard before if you've been paying attention. And then there are five (yeah, we were surprised, too) stories—all *extremely* good—by writers who have never been published before. As you might have guessed from the title, the idea behind the anthology was to present the widest possible range of science fiction and fantasy reading experiences in one volume. Therefore the stories run from Spinrad's harrowing "Journals of the Plague Years," to Goldstein's dreamy "My Year with the Aliens," to Disch's haunting "Voices of the Kill," to Shiner's outrageous "Oz," to Kevin J. Anderson and Doug Beason's powerful, hard sf story "Reflections in a Magnetic Mirror," to Steven Bryan Bieler's gorgeous baseball story "Tinker to Evers to Chance."

In a very real sense, **Full Spectrum** is our love song to science fiction and fantasy. We hope it represents much of what is wonderful about our literature. Please give it a try.

And if you're ever in Manhattan, be sure to visit Imperial Dragon. Order the Velvet Corn Soup. Spectacular.



SPECTRA BANTAM

TEAM SPECTRA

FULL SPECTRUM

edited by Lou Aronica and Shawna McCarthy

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longer essential to publication. The other level on which computers are revolutionizing publishing promises to have even greater impact. That is the direct transfer of information via networks made of computers and telephone lines.

A good many networks already exist, and they are growing both in number and in size. When a computer network has enough subscribers, every one of them is in effect a potential publisher with a ready-made potential audience. It's easy to imagine, and probably inevitable in the not too distant future, that some of those networks will get big enough to constitute audiences comparable to the present readership of major magazines. Anyone who wants to reach that readership need only pay his subscription fees and put what he wants to publish on the network's electronic bulletin board. In effect, anybody will be able to publish anything, without getting an editor's approval first.

Does this mean editors will no longer be necessary? It might seem so at first, but I predict that an ironic side effect of this revolution in publishing will be more demand for editors than ever before. One reason we already need them is the sheer volume of the flood of information. If everybody can publish, that flood will be multiplied many times. If you are on a computer net, you will be able to send your thoughts out to seek readers; but many, many others will be doing the same. How will you decide which of their offerings to read? Chances are that unless you are a very, very fast reader, or have a great deal of free time, or both, you're going to be very interested in having somebody you trust go through all that stuff identifying parts of it likely to interest *you*—in other words, one or more editors.

Please note, though, that the *role* of an editor in a system like this will be quite different from what it is now. The preceding paragraph, arguing an increased need for editors when anybody can publish anything, does *not* mean we'll soon be back where we started, only more so. Now, because the amount that can be published is so limited, an editor operates by letting through a few things he thinks his readers will like and blocking the flow of all else. When anybody can publish anything, none of the flow will be blocked. Instead of being a selective barrier, an editor will be a "tagger" who conspicuously marks certain parts of the flow as being likely to interest certain people—but the rest of the flow will still be available for anyone who wants to browse in it. It will be as if you still had *Analog*, consisting of stories and articles I picked out as having certain qualities, but you also had access to my entire slush pile. With that access, you might well discover a writer you think is great but I never use—and you could then read all his future work by watching for his name in the flow, even if I never saw the light and started recommending him. Even if things changed no more than this, the revolution would be profound. Instead of the present situation, where filtered reading means filtered publication, the new arrangement will offer writers the option of *un*filtered publication, and readers the option of *either* filtered or unfiltered reading.

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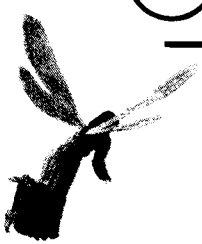

The princess knew that someday her prince would come, but she had no idea that he'd come as such a big shock. First he arrived in the form of (well, it's too nasty to mention). And then, when he was finally turned back into himself, he turned out to be a beast of another and even more confounding kind. In short, a man.

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And in practice, things probably will change much more than this. Key question: who will the editors be? Some, I suspect, will continue to be professionals specializing in editing, sought out and paid by readers to find material they like and by writers to help make their work better. But if the system is set up right, it not only makes it possible for everybody to be a published writer, but also makes it possible for everybody to be an editor. Imagine a vast network of computers in which anybody can publish anything—including comments on what other people have published. Imagine further that every comment on a work, or reference to it, is visibly linked to it so that anyone reading the work itself can see at a glance who else has been moved to say anything about it, and read any of their comments that he chooses. A writer will be able to gain a following not only through what he says, but through what others say about it. And someone whose comments gain him a reputation for leading readers to things they want to read is likely to find himself an editor of note, whether he ever consciously thought about being one or not.

Will writers and editors receive any payment for their labors under such a system? Some provision clearly needs to be made for that, since high-quality work tends to demand so much time and energy that not much of it can be done by people who have to spend large amounts of time and energy putting food on their tables by other means. Just as clearly, not everything of the huge amount published is going to warrant equal payment; and if it got equal payment, that payment would be absurdly and uselessly small. One possible solution is that everybody pays a small fee to the network for the right to publish on it, and writers receive payment from the network based on how much their writings are used by readers.

Some of you will recognize the extrapolated free-enterprise publishing system I have just described as a *hypertext* system, a term and concept created by Theodor Nelson. "Text," as we now think of it, consists of information arranged in a one-dimensional sequence, from the beginning of a book through all the pages to the end. Indexes and bibliographies provide weak, cumbersome links between related material in different parts of the text and between the text and related material in other texts; but those links are indeed weak, cumbersome, and sparse. Hypertext, in its most developed form, will make all possible links, within the text and to other sources outside it, explicit and instantly accessible. When publishing meant "ink on paper," such a multiply linked and variously accessible system of information handling was desirable but far from feasible. With modern computers, it's relatively easy. And it's coming—a lot of work has already been done on its development by such people as the Project Xanadu group in California.

If you haven't run across the term or the concept of hypertext before, I strongly recommend that you look into it. Its implications are far more extensive than I can do justice to in this small space,

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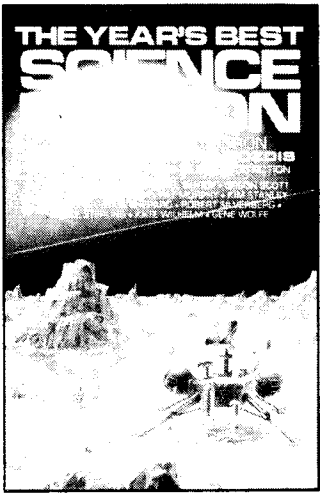
This latest in the highly-acclaimed series features more than 250,000 words of fantastic fiction by some of the best science fiction writers of our times. Two-time Nebula winner Gardner Dozois, editor of *Isaac Asimov's Science Fiction* Magazine, has compiled a breathtaking collection by such writers as **Michael Bishop • Orson Scott Card • Ursula K. Le Guin • Pat Murphy • Kim Stanley Robinson • Lucius Shepard • Robert Silverberg • Bruce Sterling • Kate Wilhelm • Gene Wolfe** • and more. In addition, you'll find a thorough summation of the year 1987 in science fiction and a comprehensive list of recommended reading. No wonder readers and reviewers agree: **this is the one book no science fiction reader should be without!**



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but there are other places where you can read about it. Chapter 14 of K. Eric Drexler's *Engines of Creation*, called "The Network of Knowledge," is a good introduction, and it will lead you to others, such as Theodor Nelson's own *Literary Machines*.

It's important. The revolution this promises is at least as great as that produced by the invention of movable type—and it's already underway. ■

IN TIMES TO COME

● Our October issue features Randy Asplund-Faith's first *Analog* cover, depicting a crucial moment in the life of the "Sunstat" in the novelette of the same name, by Jerry Oltion and Lee Goodloe. Suitably designed solar sails could, of course, be used to suspend colonies or research stations in fixed locations relative to the Sun—including certain locations of special interest that would be very difficult to study otherwise. But such a station, along with its special capabilities, would have special vulnerabilities. Some of those are technical, inherent in its location and structural nature; others, not surprisingly, are political and psychological. . . .

The October fact article is "High-Tech for the Little Red Schoolhouse," in which Roberta Jane Pournelle examines some of the ways microcomputers can and should be revolutionizing education. We'll also have Part III of Charles Sheffield's *Proteus Unbound*, and a diverse assortment of shorter fiction, including a unique mystery by Michael F. Flynn. Science fiction and mystery are notoriously difficult to combine, but Flynn has done it quite adroitly. The case seems, at first glance, open-and-shut: there's a positive eyewitness identification of the criminal, and corroborating evidence more positive still. But there's also one little factor that makes all of that useless and leaves the detectives with quite a task on their hands. . . .

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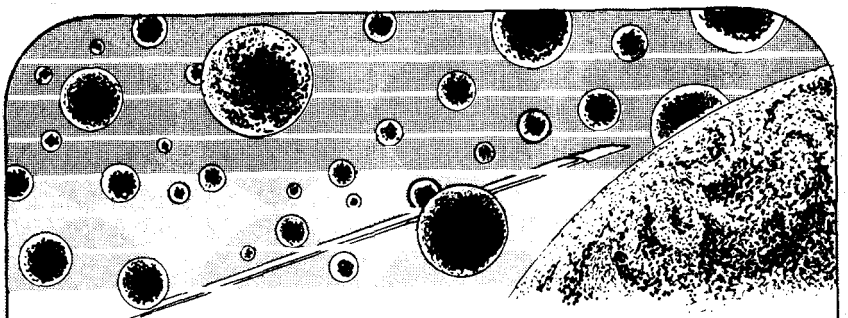

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THE FALLING WOMAN
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(*IAsfm*, August 1987)

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Best Short Story

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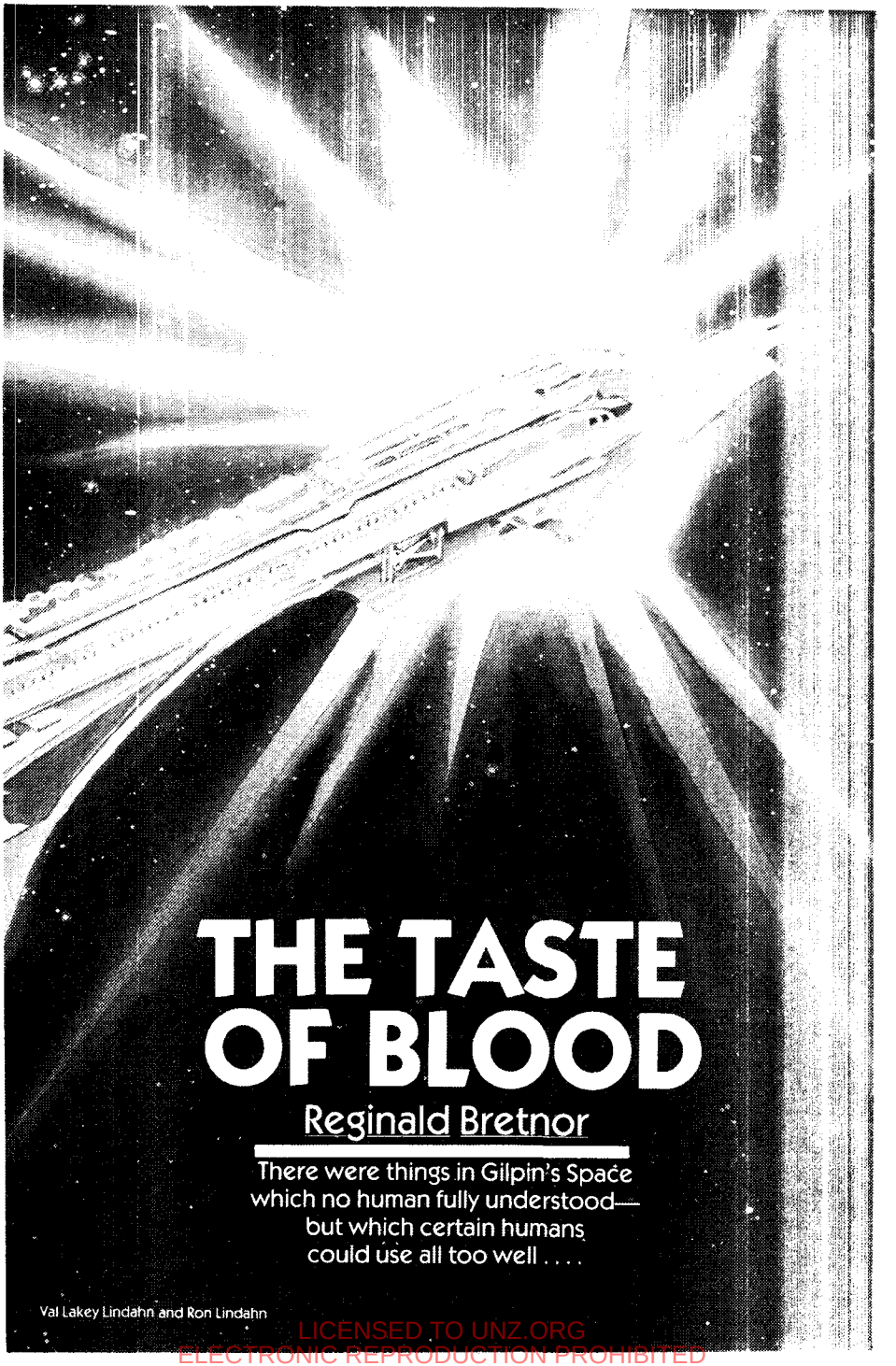

THE TASTE OF BLOOD

Reginald Bretnor

There were things in Gilpin's Space
which no human fully understood—
but which certain humans
could use all too well . . . .

Val Lakey Lindahn and Ron Lindahn

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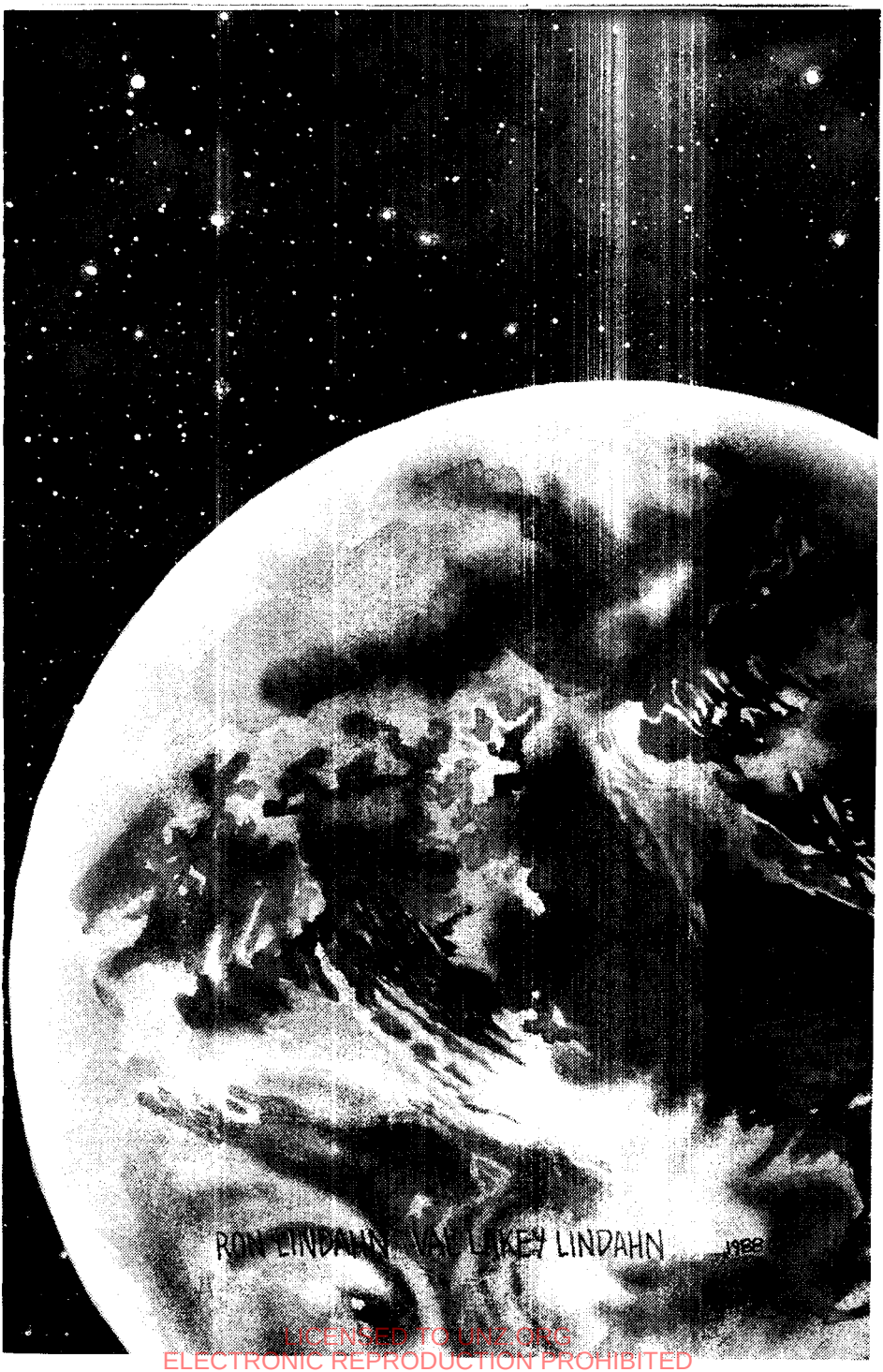

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I.

For the first time in half a dozen years, Björn Ricardi was his own man. That morning, at the civilian spaceport five miles from Freyberg Harbor, he had handed over his command to her new owners, and Louisa had decided to go with them. That was no surprise—for months each had known that the relationship was nearing its natural end, and any bitterness there might have been was carefully covered over with their politenesses. She had told him, smiling, that the Far Reaches of Gilpin's Space were where she lived, that if he wanted to leave the ship and be an aardvark, she'd not stop him, and he'd joked about whether he'd have trouble learning to be a proper earth-pig. They had kissed goodbye unemotionally, like strangers parting.

At his hotel, he changed out of uniform, leaving only the small golden symbol of infinity required by law, announcing that he was a Far Outer. Then he took a cab to the Freyberg Harbor headquarters of that Legion of Earth which, patterned after the old French Légion Etrangère, was charged with the defense of the Solar System against any possible alien antagonists and, more covertly, with helping to maintain the fragile peace between Earth's totalitarian superpowers. Like quite a few Far Outers, he held a low-profile reserve commission in the Legion, so its Officers Club seemed a natural choice to start celebrating his new life.

He was a big, tawny-bearded lion of a man, with his half-Italian father's surprisingly dark eyes. He moved with great deliberation, with precision, which sometimes led people to think that he was slow. He wasn't.

Identifying himself, he took the elevator to the third floor dining room, and Hans, the headwaiter, greeted him by name. "Welcome back, Captain Ricardi," he said, bowing Björn to a window table. "Colonel Pardee said your ship was changing hands."

"That's right," Björn answered. "I'm on the beach."

"But not for long, sir. I'll bet on that."

"Well, I don't know. I just might decide to be an aardvark for a while. Or—" He grinned. "—who knows?"

After Hans had taken his order for a gin-and-tonic, he let his eyes enjoy the post's red-tile rooftops, its docks and boulevards and parks. He didn't hear Colonel Pardee approach until one of the table's other chairs was being drawn back and then the Colonel's familiar Virginian voice was greeting him.

Instantly, he was on his feet. "Burton, it is good to see you!"

They shook hands. "Sit down, Björn, sit down." Pardee folded himself into his chair. "What's been happening?"

"Not much, really." Over their drinks, Björn filled him in on what had been a profitable but generally unexciting voyage. "But I've done a bit of thinking—did I want to keep on as the master of what is basically a freighter, and not even a freighter of my own? I decided I needed something else." He laughed. "The junior high school lecture circuit or something."

Pardee's blue eyes twinkled. "A tour of active duty?" he suggested.

Björn shook his head. "Sir, I'm a man of peace," he said.

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"So are we all," the colonel answered, a little sharply. "That, my boy, is what the Legion is all about."

Björn murmured an apology, and the conversation shifted: mutual friends, ships and what had become of them, the world politics from which the Legion was sworn to hold itself aloof—the eternal rivalry of Soviet totalitarianism and the newer totalitarianism of America's falsely named Individualist People's Party.

The meal was excellent. While they talked, Björn watched his fellow diners, most of the men in the Legion's sky-blue uniform, which some women also wore, and quite a number in civilian clothes. They came and went, many coming over to greet the colonel and be introduced, always glancing at Björn's Far Outer badge.

Then, in an instant, Björn forgot them all. At the entrance, a young woman was asking Hans a question, and Hans was answering, bowing repeatedly. "Well, well!" Björn exclaimed. "Burton, who is she?"

She was tall, and she seemed to be made of light, her hair so blonde that it was almost silver, hanging in two heavy braids almost to her waist, and she was gowned dramatically in gold and silver.

Pardee smiled. "Beautiful, isn't she?"

"Much too theatrical for me," Björn said. "I'm afraid I'm not that incurably romantic."

"Björn, her name is Rebecca Whitworth, and there's much more to her than theatricality. She's a harpist—they say one of the world's finest. Look at her hands."

Björn looked at them, and recognized their grace and discipline and strength. "She's Arthurian," he said. "Not truly, no, but like those wonderfully unreal women the late Victorians dreamed of, William Morris and that crew. What's she doing here?"

"As a matter of fact," Pardee told him, "she's looking for you, and I imagine Hans is about to lead her over here."

"For *me?*"

"For you, my friend. As soon as I got word that you were on your way over—and as Freyberg's Intelligence Officer I receive word rather rapidly—I phoned her."

"But *why?*"

"Because she is determined to offer you a ship, a new command. I gave you the best possible recommendation."

"Good Lord, Burton, I haven't even had a chance to go fishing!"

"Every world with seas has its fishes, Björn, many of them even more sporting than New Zealand's, but how many worlds can show you girls like that?"

Now Hans was ushering her across the room, all eyes upon her.

Björn and the colonel stood, and while Hans held a chair for her Pardee said, "Becky, this is Björn Ricardi, Captain Ricardi, whom I recommended to you."

She raised her dark gray eyes, looked deeply into Björn's. Then she smiled, held out her hand. Annoyed at his temptation to bow and kiss it, Björn took it very gently in his own. Suddenly he felt that she was judging him almost as a Far Outer might, intuitively, almost telepathically.

"I have already made the acquaintance of your harp," he told her, "but

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only on a sound-cube. This is an unexpected pleasure."

"Cousin Burton here described you very accurately," she said as she took her seat, and again she smiled.

Hans took her order, and until her drink arrived she made small talk with Pardee: friends, family, the small intimacies of people's lives. Björn gathered that Pardee was a distant cousin of her mother's, and that she was very close to an uncle, Morrison Whitworth.

The name rang a bell, and he remembered that this was the Whitworth of shipyards in Singapore. *That,* he thought, *at least explains where the ship is coming from. But it doesn't tell me what she plans to do with it.*

As though she'd caught the thought, she turned to him. "Did Cousin Burton tell you why he arranged this meeting for us?"

"He told me you wanted a Far Outer captain, but that's all he told me."

"Well, in that case I'll explain. I do want a Far Outer captain, and a crew as well, for a voyage probably like no other Gilpin ship has ever made. You see, for three years now I have been performing with a man of whom I am, well, very fond. His name is Anders Jelk—spelled with a J—and he is truly a great composer, a great performer. His instrument is the electronic synthesizer, one he himself developed. He is giving new expression to the renaissance of great classical music that followed the hideous noise-making of the seventies, eighties, and nineties. He evokes new voices, unheard-of instruments, utterly new tonalities and modes and patterns, and he especially loves to weave them around one traditional instrument. It could be a flute, a violin, a French horn, or for that matter a string quartet or chamber orchestra, but he prefers the single focus. And he is in love with—no, not with me—" Her voice carried a hint of bitterness. "—but with my harp. Together we have made magic, we have created splendors, or at least *he* has. But there is a reason why he cannot realize his full potential." She paused. "Captain," she said, "what I am about to tell you must never, *never* be repeated."

"I can assure you it won't be," Pardee told her.

"Good." She paused, closed her eyes a second. "Very well, then. Anders has one terrible failing, one which I tried for our first two years not to see. Finally, even I had to admit it because I saw that it was threatening, not only our relationship, but what he otherwise might be accomplishing."

"And that failing is?" Björn asked quietly.

"*He is cruel,*" she whispered. "He is cruel to me, cruel to all his friends—the few he hasn't driven off. He—he can't even be left alone with small animals. And he won't discuss it." Again she looked into Björn's eyes. "That is what I hope the Far Reaches can cure. Yes, I know exactly what I'm saying. I've lived through that dreadful telepathic screaming, those unspeakable agonies of beings for whom we have no names, their hopelessness, their tears, their terrible rages—all of it. And I've been told that I myself would make a good Far Outer, because I've always been able to detach myself even in my sleep, feeling only pity for them. You understand?"

"I should." Björn smiled.

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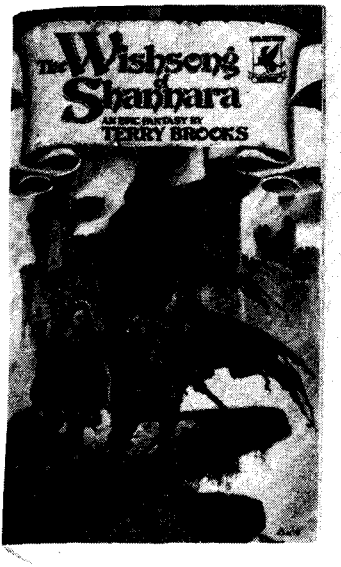

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"Of course—for a moment I forgot. Anyhow, it's my hope that when he actually is invaded by those voices, when they penetrate that cold, hard shell of his, that finally he will learn what pity means, and kindness, and consideration."

"You realize, of course, that we'd be risking his sanity? I shan't point out that there also may be danger to us and to the ship—that we can allow for and prepare against."

"Captain, he understands the risk, and he's as eager to take it as I myself, but for a very different reason. Naturally he knows what happens in the Far Reaches—everyone does, even if only from exaggerated, distorted mass media accounts. He believes those voices can give him new material for his music, and he's completely confident of his own invulnerability. *Lyra* is my uncle's gift to me—*he* appreciates what our success would mean. As for you, and any crew you choose, you can name your price."

"You are more than generous," Björn said.

"All I ask," she told him, and he could hear the mounting tension in her voice, "is that we penetrate the Far Reaches as deeply as anyone who has gone there and returned. Then, if we finally have to admit failure—well, I'll have to take a fresh look at my whole life."

Björn, looking at her, saw instantly and clearly that no one could talk her out of it, that she was too strong a personality for that. He realized, too, that were he to turn her down there'd be others only too eager to accept. And he knew that Burton Pardee wanted him to take the offer. Very definitely, he had not wanted another command, not so soon—yet he felt tempted.

He temporized. "This has been very sudden. As you know, I've just come Earthside. I'll need time to think, and I'll need to meet Ander Jelk, and see the ship, too, of course."

"Of course. I'm not asking you to buy a pig in a poke." She glanced at her watch. "Anders is going to meet me here, and he'll arrive at any moment—he's late already. As for the ship, I think you'll like her. She's new, and everything aboard is the best available—" She broke off, turned her head "But here he is now—"

Björn looked. At the door, Hans was obviously offering to escort Jelk to their table, and was being brusquely brushed off. Jelk was very tall, and even at a distance his appearance was athletic and almost military, broad shoulders, waist so narrow it seemed almost corseted His light brown hair, worn nearly at shoulder length, was cut off square and looked as though it had been ironed flat The overall effect was uncannily medieval. He strode toward them, and Björn, long practiced at judging men, took in every detail. His first impression was one of great strength, of tremendous drive. His next, when he saw Jelk's heavy jaw muscles and narrow nostrils, was of great inner tensions. Then he looked at the man's eyes, and felt as if he had peered into the bleak coldness of a glacier.

He and Pardee stood, and Rebecca Whitworth introduced them.

"Ah, the Captain?" Jelk's tone was derogatory, his smile sarcastic.

Björn offered his hand, murmuring

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a conventional pleased-to-meet-you phrase.

Jelk looked at the hand a moment before he took it, and then without warning he made the handshake a test of strength. It was a game with which Björn was thoroughly familiar, and he did not respond, using his own hand's pressure passively, simply to withstand the pressure. Jelk kept it up for several seconds, then with a tiny shrug gave it up, released Björn's hand, said he was happy to meet the captain who would take them on their journey, sat down in the remaining chair, and told Hans to go away when he came to take his order. He apologized to Rebecca Whitworth for his lateness; there had been an important overseas call. He inquired after Burton Pardee's health, then began to question Björn about the Far Reaches. His manner toward Rebecca was insolently proprietarial.

Björn answered all his questions. He had known instantly that he never could like Jelk, partly because he had been so rude to Hans, partly because of his manner toward Rebecca, but mostly because of his strengthening certainty that something within the man—genius or no genius—was twisted, *wrong*.

And suddenly, illogically, he knew that he'd accept, that he would captain *Lyra* into the Far Reaches, simply because Anders Jelk was a threat to Rebecca Whitworth. Instinctively, he felt that she'd be safer in his ship than in any other, and realized simultaneously that this was why Burton Pardee had recommended him.

For the next fifteen minutes, Jelk questioned him about the telepathic assaults against men's minds which always started when, in Gilpin's Space, one had passed beyond the Solar System's null zone of perhaps fifty light-years. His questions betrayed no apprehension. When Björn described the personality types who almost always failed the test, he sneered openly—there were, he said, far more weak people in the world than strong ones.

It was Rebecca who finally said, "Come, Anders, we'll have time for that later. Captain Ricardi wants to see the ship."

She stood, and the three men rose with her. "I have already seen it," Jelk declared, "so I'll go back to my music. This has been very entertaining, Captain." He patted Rebecca on the cheek, nodded goodbye to Pardee and Björn, and stalked off without another word.

"Now, perhaps you understand," she said, hesitantly and sadly, "why I have to break through his shell, his armor. Or no—you can't. Not until you hear his music, not until then."

Björn said nothing. He and Pardee exchanged glances.

The ship was everything Björn could have wanted. She was broad in the beam, but in no way clumsy. Her electronic system, her instrumentation, her exterior sensors and manipulating servos and cutting lasers all were the very best available, and wherever he looked he saw that careful redundancy which makes a responsible captain feel at ease. Below decks, her wardroom was twice as large as the average vessel's, much more luxurious. Here some yacht designer had really been turned loose. No expense had been spared on upholstery, on an absolutely imperial wet-bar, on

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the grand piano in one corner, or on the holographic equipment and data screens; and her cabins offered a degree of space and privacy seldom encountered on those Gilpin ships—and they still were in the majority—which had started out as naval or cargo submarines. Her engine room, containing her Gilpin Drive, her nukepak, and the motors that drove her two propellers on the sea's surface or in her submarine mode were of a piece with the rest of her.

Björn did not comment until after the inspection. Then, "This morning," he said, "I was telling myself I'd not go out again for six months at least, but I'm going to accept your offer. However, there are two points I have to make quite clear. First, Far Outer captains have the final say in the selection of their crews. We sometimes have to take our chances with—" he hesitated, trying to be tactful. "—with an occasional dubious risk, but never more than one or two. You can see why."

"You're thinking of Anders, aren't you?"

He nodded.

"Because of his—his tension?"

"That primarily. It's as though he has a coiled spring inside. But also I could feel the cruelty you spoke of. We can chance all that, but I can take no chances with my working crew."

"What is your second point?"

"Far Outer crews function on much more of a consultative basis than those of ordinary Gilpin ships, but ultimately the captain's decision is obeyed. I'm not being arrogant. This means survival."

"I understand. And how long will it take you to choose your crew?"

"Most of the people from my old ship are still here. I won't need anybody else. Of course, a few took off to visit friends or relatives, so I hope we won't leave for a few weeks."

"Anders and I have scheduled quite a few recitals, so five or six weeks would be ideal."

"Good. Then, if we come to an agreement, I'll start contacting them immediately."

"Captain Björn, I think we already have agreed. Where money is concerned—suppose I pay half again the going rate on my uncle's ships, with all the same guarantees?"

"Fair enough."

"Then you do agree."

"I'm happy to." They smiled at each other. "Let's shake on it."

She took his hand. Her own was very cool and strong.

"It's early yet, but I'd best get started," Björn said. "I'll hurry back and begin phoning people."

"I'll run you over," offered Pardee. "We can drop Becky on the way."

After they had left her at her hotel, Pardee said, "Björn, I owe you an apology. I should've briefed you before I ever mentioned her to you, but I wanted you to come to it quite uninfluenced. As I think you've noticed, I'm really fond of Becky, and not just because she's kin." His eyes narrowed and he stroked his gray moustache. "And I'm not fond of Anders Jelk. I smell danger there, to her at least, perhaps to others. Björn, do you know anything about a movement calling itself Man Triumphant?"

"Man is divinely appointed to rule the Universe, and all the dangers in the

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Far Reaches are fakes, cooked up by Far Outers, probably under alien influence? I've always assumed they weren't worth worrying about."

"Things have changed, Björn. Their pitch has an appeal as old as man's history—much older than *Mein Kampf* or *Das Kapital*. *Our* gods, or *our* rulers, or *our* way of offering blood sacrifices are so superior that it's our sacred duty to step on everyone—Egypt, Persia, Rome, the Mongols, the Japanese, you name it. The Man Triumphant people have just put it on a Galactic scale and substituted aliens for human enemies. They now have two or three hundred thousand members, and their own colony planet, though it's well within the Null Zone. It's a soft world and they've done pretty well for themselves with U.N. help. They've even sent ships into the Far Reaches to prove their point, and they blame the fact that none have returned on you Far Outers and your alien friends."

"Even so—" Björn frowned.

"If that were all, they still might pose no real danger. But they're getting heavy financing, and their present leadership is a functioning *troika*, one of whom represents the international conglomerates and their IPP, another the Commies, and a third, the nominal leader, who is considered the spiritual heir of Kondras Lassa, who wrote the book after which the movement's named: *Man Triumphant*. We know what caused the change. Russia's been increasingly uptight about rising unrest among minorities—before too long, the Moslems are going to outnumber the Russkies if they don't watch out. On the other side, the IPP has lost a lot of face because, especially since the Legion's been established, several nations they thought they'd taken over have had the guts to throw them out. So now each side seems to be trying to manipulate Man Triumphant, to what end we don't yet know. But the situation's getting ugly. Besides, a couple of Far Outer ships are known to have landed on Lassa, their planet, named after their guru, and simply disappeared—and not into Gilpin's Space. And now here's the clincher: our friend Anders Jelk's not just a member—he's way up in their heirarchy. *We* only recently learned of that because he's been keeping a low profile, for professional reasons and perhaps because of Becky. How does that touch you?"

"It complicates matters," said Björn grimly.

Pardee nodded. "Do you want to back out?"

"I'll manage," Björn answered.

"You're sure? Remember, he's a suspicious, jealous beast."

"That doesn't worry me. They say jealousy's a sign of insecurity. In his case, I think it's due to a preposterous vanity. Anyhow, I'm glad I came to this cold turkey." Björn grinned. "Now I'll have no one to blame but myself."

"Björn, are you interested in Becky?" Pardee asked softly.

"As an artist, yes. As a shipowner, yes. As a relative of yours, of course. As a woman? Well, I've been in the Far Reaches with people who hated me, with people I detested—though God knows I do my best to avoid such situations—and I've learned. I never—I repeat *never* go after another man's woman."

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For a moment, Pardee did not reply. Then he said, "I wonder, Björn? I'd a hell of a lot sooner see Becky with you."

"Burton, I appreciate the compliment, but I don't work that way."

Pardee sighed. "I know. If I thought you did, I suppose I'd never have recommended you."

They let their conversation drift into less serious channels until they reached Björn's hotel.

"Keep me posted," Pardee said. "Dinner tonight? At the Club?"

"Right," Björn responded.

Back in his room, he dug out his ship's roster. Gilpin ships, almost completely automated, carried only minimal crews, highly skilled, with multiple talents and widely varying backgrounds:

Juan José Salazar, Astrogator, First Officer

Jennie Salazar, Assistant Astrogator (xenologist)

Louisa Merriman, Second Officer (M.D.)

Björn crossed her out, and wrote *defected* after her name.

Alvin Edelman, Nukepak Engineer (fighter pilot)

Elsa Thorn, Chief Cook and Bottlewasher (analytical chemist)

They were all listed by couples, which was the way with Far Outers.

Hiram McCurdey, Chief Engineer (electronics)

Raisa McCurdey, Assistant Engineer (electronics)

And so it went through the fourteen of them. Actually, the terms meant little, for James Petulengro and his wife, Helena, signed on as steward-bartender and stewardess, had backgrounds in ecology and terrestrial zoology. As in most successful Far Outer crews, everyone was prepared at least to assist in everyone else's job.

Björn spent the rest of the afternoon on the phone. A few he reached directly; a few others were asked to call back as soon as possible; two couples had already taken off, one to England, the other to Norway. He knew their destinations and decided to call them the next day. By the time he met Pardee for dinner, he was already certain of half his old crew, though he had had to take a great deal of ribbing about his inability to stay glued to old Mother Earth.

"It's going nicely," he told Pardee. "I explained about Anders Jelk and what Miss Whitworth had planned for him, and while most of them thought it was pretty weird, they were all intrigued by *Lyra*. We'll probably lose four or five, but that won't hurt—we'll have more than enough to work the ship."

"You and Becky may have to consult a lot," Pardee said. "I can help you there. If I stay in the picture, it'll avoid a lot of Jelk's jealousy. But before anything else, you ought to attend one of their recitals, so you'll understand what makes her tick. They have one coming up two days from now here in Freyberg Town, and Becky'll see that you get tickets."

Björn lifted a tawny eyebrow. "You think it's *that* important?"

"I do. You'll have a much deeper understanding of them both. For all I know, you may even want to cancel out."

"I think not. There are a couple of

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my crew whom I'd like to take along and who're still here—Lee Twopersons and his wife Alicia. Lee's a Blackfoot, but she's a Hopi, and actually related to that Hopi couple who went with Saul Gilpin when he took off and gave the world his drive. Alicia's about as close to being a telepath as anyone I know. She sees deeply into people."

Pardee did not scoff. It was common knowledge that Saul Gilpin, brought up among the Hopi, speaking their tongue, owed them much. Indeed, all Gilpin ships, even those belonging to the Legion—all except ships serving the totalitarian powers, and probably even some of those—still had kachina dolls and portraits of Gilpin and his daughter and his Chinese wife in their wardrooms.

"Bring them along by all means," Pardee said.

By late afternoon the next day, Björn had made certain of all but two couples, who had pressing business Earthside; and Petulengro, calling from somewhere in Wales, spoke for everyone when he said, "Skipper, don't tell me any more. Hell, we've been with you almost six years now."

Their reaction made Björn's day, and next morning, when he and Pardee met Rebecca and Anders Jelk to discuss ship's business, he found it easy enough to ignore Jelk's obvious hostility. Jelk stayed a short time only, and to Björn's surprise, just before he took his departure, he apologized for his behavior at their first meeting. "Captain," he said, "I fear I gave you the wrong impression when we met. I have a bad temper. When my music does not go well, I am like a bear with a sore foot. You understand?"

Björn, taking it with a grain of salt, told him to think nothing of it. He assumed that Pardee or Rebecca, or both of them, had leaned on Jelk, and told himself that even a promise of good behavior, regardless of its motivation, boded well for tranquility.

On the evening of the second day, Björn again had dinner with Pardee, introducing him to Lee Twopersons and Alicia, and afterwards the Colonel drove them to the Freyberg Town Opera House, much smaller and less flamboyant than Sydney's, but beautifully appointed and acoustically perfect.

Their tickets admitted them to a box on the lower tier. Pardee wore civilian evening dress, Björn and Twopersons business suits, Alicia a dinner gown—Far Outers weren't expected to follow the new formality too rigidly. Twopersons sat erect, an amiable bronze statue, Alicia, disarmingly petite, beside him.

The orchestra pit was empty. They waited. Björn read the program with its usual information about the performers, where Rebecca had studied, where she had been acclaimed, the fact that her superb harp had been built specially for her by Caradoque in Paris. The notes on Jelk, surprisingly scanty, were devoted almost entirely to praise of his electronic expertise and to the critics' comments on his artistry. All the while, a strange, small, spidery man in an ill-fitting black suit moved back and forth, fiddling with the synthesizer, setting out sheet music. When Jelk and Rebecca made their appearance, he quietly disappeared.

The program consisted of a wide

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range of short pieces, most of them "transcribed and arranged for harp and synthesizer by Rebecca Whitworth and Anders Jelk." It began with variations on a theme by Henry Purcell, and continued with Jacques Champion de Chambonnières, Rameau, Handel, Parish-Alvars, de Falla, and such moderns as Inada and Santesson.

Björn looked at Pardee inquiringly. "Purcell's *Nymphs and Shepherds?* I've heard it—a song, very pleasant and pastoral, with nice little musical swirls here and there. What on earth can they possibly make of it?"

"*Nymphs and shepherds, come away,*" Pardee murmured, smiling. "*Come, come, come away!* In a minute you'll understand."

Abruptly there was a flourish, not of trumpets, but of wind instruments nonexistent except in Jelk's mind. It was bold, compelling, more so than trumpets ever could have been. The heavy curtains, green and golden, opened. Under a spotlight front and center sat Rebecca Whitworth, her great harp next to her.

Behind her, Anders Jelk sat at his console, indirect lighting showing the black and white of his traditional evening dress.

The harp spoke. Gently, with unbelievable clarity, the notes of Purcell's cheerful air sang out, stating the theme simply but with those mysterious harmonics harp strings generate.

Björn, listening, suddenly realized that while he had heard harps many times, never before had he really listened to one.

It was a moment before he was even aware that now the synthesizer was joining in; softly, very softly, phantom woodwinds were making themselves heard, whispering, whistling, twittering. There was a spring wind in the leaves, laughter and the sound of dancing feet under a glorious sun. As the theme was stated and restated, the synthesizer wove its webs around it, complementing it, enriching it, never obtruding, never interfering, but seeming always to lead in new directions.

Björn closed his eyes—shepherds and nymphs and wild, gamboling satyrs. No longer Baroque toys, they danced for him, vital, eternal, full, full of youth and joy. And the harp's notes danced with them, wonderfully alive.

Then, as suddenly as it had started, it was over. She smiled at the audience, waved at them. Jelk stood up, bowed stiffly. Presently the applause subsided, and they began again; and through the entire recital the relation between harp and synthesizer, between Rebecca Whitworth and Anders Jelk, persisted, through Baroque selections, Romantic, Impressionistic, then after an intermission into the extravaganza of the moderns. As the harp sang, the synthesizer echoed and restated, elaborated, ornamented, still without obtruding.

During the intermission, sitting at the bar, Björn told Pardee, reluctantly, that he now knew why Rebecca valued Anders Jelk. "I can't imagine how he does it," he said, "but what really surprises me is that he lets her have the center of the stage. Regardless of his personality, he's a great musician."

He looked at Alicia, sitting silently beside her husband. "What do you think?" he asked.

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She frowned. "I'll tell you later, after we've heard more."

Through the recital, though the intensity of the music increased along a steepening curve, no matter how gay or dark the theme, how looming, how frenetic, Jelk wove the synthesizer's increasingly complex embroideries around and into it without ever infringing on the harp's central prerogative. Even in the final selection, Santesson's *Cry Havoc*— even in that, when the synthesizer's shrill, despairing waves of sound swept through the entire house, the harp's triumphant song was allowed to ride the waves unharmed.

Finally, it ended; and Björn, like every person there, suddenly felt empty and deprived. For seconds, the audience held its breath. Then its applause stormed out. Rebecca smiled. Jelk stood again. The applause roared on. Rebecca held up both her hands. Then, slowly, the curtains closed. The house manager stepped out, motioned for quiet.

"There will be no encore," he announced. "This recital has been a tremendous *tour de force*. Miss Whitworth is exhausted, and Mr. Jelk, I know, is also tired."

The audience sighed its disappointment, and after a moment's hesitation forbore to applaud again. Quietly, they started filing out.

Björn turned round in his seat. Alicia's brows were knitted. "Well?" he said.

She hesitated. She bit her lip. "He—Björn, you were right about him. There's genius there, but there's much more to him than that—he is dangerous, that one. He makes magic, but it is not good magic. From the beginning, everything he played, even when it was most intense, most emotional, was played coldly, calculatingly. His own emotions, whatever they may be, did not enter in. He was concealing, holding back. I do not like to think of it."

II.

Actually, there turned out to be much less consulting to do than Pardee had expected, and the three sessions Björn and Rebecca found necessary went much more smoothly than he'd expected. Jelk was absent from all three of them.

During the entire week that passed before their tour began, there was no more friction. The day they left, Björn moved into *Lyra*'s captain's cabin—as always aboard Gilpin ships, adjoining the control tower. It was roomier than any he had ever occupied, and the crew's cabins were almost as well appointed. As for the owner's suite, it was absolutely luxurious, with two panelled bedrooms, two bathrooms, and its salon or sitting-room. Björn thought about Jelk and Rebecca occupying it, and slapped his wrist mentally for his swift twinge of—of what? Envy? Jealousy?

For a fortnight, then, there was little to occupy his mind. Two by two, as he'd expected, the members of his crew began coming in. As Juan Salazár put it, "Why pay a hotel when we can live aboard free with pay?" Actually, of course, it was because they couldn't wait to familiarize themselves with *Lyra*. The Salazars and the McCurdeys were first, then Alvin Edelman and Elsa Thorn. The Petulengros called again, promising they'd come directly. When, at short notice, Morrison Whitworth himself showed up, Björn had enough

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of a complement to show the ship off properly.

Whitworth had phoned Pardee to say he was on the way, and Pardee had passed the word to Björn. "He wants to check you out personally. Don't mind, do you?"

"Fair enough." Björn smiled.

Somewhere over sixty, Whitworth was bronzed and fit, wearing a brushed Guards moustache. He made no bones about sizing Björn up, and obviously he liked what he saw. Björn knew, when they shook hands, that he would have his confidence.

"You're a good judge, Pardee," Whitworth said. "Isn't he, Björn?—you don't care if I call you Björn?"

"No indeed. We Far Outers aren't much on formality."

"Good. I want to meet your crew."

For the next two days, Whitworth was with them almost full time, even for meals aboard and ashore. Finally, he came directly to the point. "Björn, I had to be absolutely sure before I really let my hair down. The job you're undertaking may affect more lives than my Becky's and—forgive my frankness—her abominable Jelk's. He's a bomb ready to go off, but it *is* true that he's a genius. It *is* true that together they accomplish musical miracles, and that those miracles mean everything to her. I love her, Björn. I love her as a person and for her talent, and so I'm giving her what she asked for, honestly hoping that the voices of the Far Reaches may break through to his humanity, if he has any. I don't believe they can. But what *will* they do to him?" He paused, lowered his voice. "That's where you come in."

"I understand."

"Very well, then. Has Burton filled you in on Jelk's Man Triumphant activities? Yes? Then you can understand why I'm especially worried about what effect the Far Out voices may have on him. Becky's certain that once he himself *feels* how intensely even the most alien beings can suffer, his intellectual flip-flop'll make him join the good guys."

"Do either you or Burton think there's a chance of that?"

"No, but we hope. My own gut feeling is that either he'll break completely or pretend he hasn't and think up some excuse to hightail it home."

"Or he could go ape," Björn said.

"Yes, he could go ape," Whitworth repeated, "and under ordinary circumstances that might be easiest to handle—but these aren't ordinary circumstances, and so, in building *Lyra* I installed something most ships don't have—a complete surveillance system. *Lyra*'s captain will be able at any time, to see and hear what's happening anywhere in the ship, *including* the owner's suite."

Björn flushed. "I'd feel like a damn Peeping Tom!"

"That doesn't matter. Your purpose, on this voyage, must be to bring Becky and *Lyra* safely home. And unfortunately you'll have to take every precaution against any harm befalling Anders Jelk. He's an international figure, musically and now politically—and the powers and politicians behind his outfit are enemies of everything you and the Legion stand for. That's it in a nasty nutshell. Well, I'll just have time to say goodbye to Burton before I take off for Singapore."

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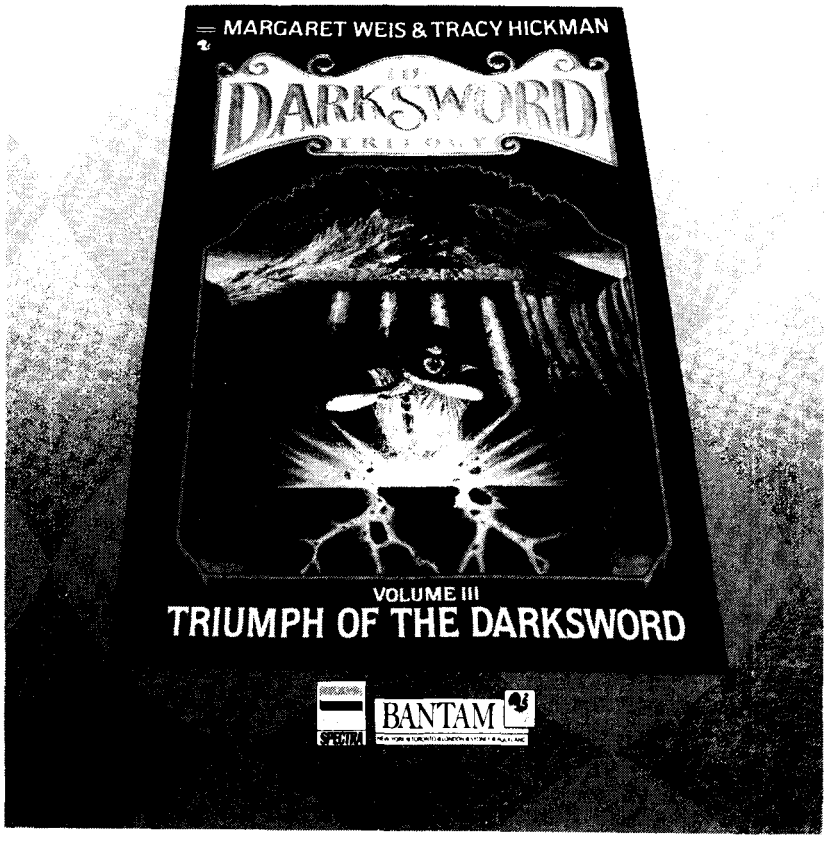

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III.

By the time Jelk and Rebecca returned to Freyberg Harbor there was little about *Lyra* that Björn and his crew didn't know. There seemed nothing more to do than have the passengers come aboard.

It was Rebecca who complicated matters. She had spoken with Pardee, asking him to come with her when she spoke to Björn, and she was obviously embarrassed. They met again in the Club's lounge, and Jelk was not with her.

"Captain," she began without preamble, "You *should* have been told about this long ago. But I knew nothing of it until this morning. Anders has just told me that he wants his—well, he's a sort of secretary-valet-footman, and like Anders he's an electronic wizard—to come with us. You must have noticed him at our recital. His name is Elmir Borrianu, and I don't like him. He's small and whiny, and you can almost see his thoughts wriggling like wet worms behind his eyes, but Anders finds him useful. I told Anders that the captain of a Far Outer ship always has final say, but he wouldn't listen. If Borrianu doesn't go, neither will he."

"Hadn't you better look him over and see what you think?" Pardee suggested before Björn could answer. "Becky dear, can you reach Mr. Jelk by phone?"

"I'm sure I can." She rose. "He's still at the hotel."

As soon as she was out of earshot, Björn frowned at Pardee and growled, "Burton, what is this? Almost at the last moment? Do you know anything about this character?"

"Yes—all of it unpleasant. Believe me, if either I or Becky had had a hint that Jelk wanted him along you'd have been told directly. He has a bad record—computer crookery, and some whispers about an attempted murder, and he's deep into Man Triumphant. He's exactly the type they attract. If you decide he's too much of a risk, we can still scrub the expedition. I won't blame you."

"I daresay Miss Whitworth won't blame me either—but what then? You know what'll happen. She and Jelk'll go scrounging for a new skipper and another crew, and probably it'll be Jelk who'll do the picking." Björn sighed. "I'll look him over, but I think you know what my decision is going to be."

"Yes," replied Pardee with a smile. "She does grow on you, doesn't she?"

Rebecca returned five minutes later. Jelk and Borrianu were on their way; and Björn realized that Jelk must have been waiting for the summons, for they arrived almost at her heels.

Her description had been only too accurate. Borrianu was pasty-faced, nervous to the point of twitchiness. His dusty black suit fitted him poorly, as though he was unused to wearing clothes. His thin hair looked as though it had been crudely pasted on. At first glance, he seemed almost wormlike, but he had a krait's eyes.

Jelk introduced them, all smiles. He apologized for not having mentioned his Man Friday before—it was because he had always taken him so much for granted. "But I promise you," he said, "you need not worry about Elmir. No indeed. I know he'll be perfectly all right in the Far Reaches—because I ex-

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pect him to, and he always does his best to please me." Suddenly there was a hard edge to his voice. "Isn't that true, Elmir?"

"Yess, Mr. Jelk," Borrianu hissed through uneven teeth. "Yess, yess, always."

This guy's incredible, thought Björn. *He comes across as weak—as weak and venemous. Christ! How long can he last in the Far Reaches? Or will Jelk turn out to be a real Svengali?*

Jelk kept on talking about Borrianu's talents, glibly, wearing the mask of camaraderie. Borrianu, he said, while not a musician, could do wonders with synthesizer circuits; while not endowed with the social graces, he could assist at any task, ashore or aboard. He was a good chess-player—Jelk laughed and slapped him —and he could make an excellent fourth at bridge. And Borrianu simply bobbed his head, his face twisted into the caricature of a smile, and hissed, "Yess, yess."

Suddenly, then, Björn had a flash of intuition, one of those which so often determined the decisions—and the survival—of Far Outers. *Yes,* he told himself, *yes*—and the feeling was very strong indeed—somehow Borrianu fitted into the picture of the future; somehow he was going to turn out to be useful.

"Fine," he said, "then all's arranged. Mr. Jelk, where will you want him? In the crew's quarters?"

"No, no," Jelk answered. "In the owner's suite. It is commodious. I depend on him so much I must have him close at hand."

Björn saw that Rebecca was going to say nothing.

"Very well," he said. "Come aboard tomorrow."

After they had left, Pardee turned to him. "Björn, you astonish me. After meeting that specimen, I expected you at least to give yourself some leeway. At best he'll be a liability, at worst a downright disaster—as though Jelk wasn't risk enough."

"Burton, we Far Outers learn when to trust our subconscious reactions. Little Mr. Creep's ancestors were probably all Transylvanian werewolves, but something tells me he's going to be useful to us somewhere down the line. Jelk looks like his puppet master, I'll grant you, but I feel there's no more love lost between them than between Frankenstein and his monster. It's damned odd, but now I feel better about it than I did before I knew Jelk wanted him along. I hope I'm not whistling in the dark."

"I *hope* not," Pardee said dubiously.

Jelk himself brought his synthesizer and Rebecca's harp aboard shortly after breakfast, and he and Borrianu spent a good two hours with the McCurdey's arranging for synthesizer hookups with *Lyra*'s audio system. The console was completely portable, and as impressive as anything would be that looked like a cross between an SST's control panel and a pipe-organ's keyboard. Björn could see the obvious distaste with which both McCurdeys viewed Borrianu and, for that matter, Jelk himself, but everyone was polite, and Jelk made no protest when McCurdey made it clear that the ship's electronic system was *his* pigeon.

Jelk had asked that provision for the console be made both in the owner's

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suite and in *Lyra*'s wardroom. "Because," he told them, "while we would like to practice in private, both Miss Whitworth and I think it might be nice if we gave short recitals for you, especially in the evening."

Björn, who suspected that the idea was probably all Rebecca's, agreed that it would be very nice indeed.

She herself joined them later in the morning, and during the afternoon she, together with Jelk and Borrianu, disappeared into their own quarters. Finally, Björn sought out Alicia Twopersons in the wardroom, where she and Lee were installing those icons of every Gilpin ship—the kachina doll and the photograph of Saul Gilpin and his wife and daughter.

"Well," he said, "what do you Native Americans think of the new face?"

Lee's features wrinkled in disgust. "Nasty, just plain nasty. Everybody thinks so. I asked 'em why our noble skipper allowed the thing aboard, and my wife was the only one who thought she knew."

"Oh?"

"You can tell me if you think I'm right, Björn," she said. "I told them something seems to have fallen into place, even if we can't see it."

"Thanks, Alicia. That's just how I feel."

Lee Twopersons grunted. "Anyway, it's nice to know the fox is in the chicken-house—so you can shoot him if you have to."

At five-fifteen, when all was ready, Björn shifted *Lyra* into Gilpin's Space. Rebecca and Jelk and the McCurdeys were in the control tower with him. Borrianu had been left in the owner's suite, as Jelk put it "to do his job."

For a while, until they were clear of Sol's system, they simply watched the ghost universe outside, as all travelers into Gilpin's Space do initially. Then Björn spoke to them about the daily running of the ship. "In the Far Reaches especially," he said, "it's customary for everyone to bear a hand, and ordinarily we have our meals together in the wardroom. As you know, there's a wet-bar there, and a splendid piano, though—" He smiled. "—I don't know how much use we'll have for it with you two aboard."

Rebecca seemed on the point of answering him, but Jelk anticipated her. "I'm afraid," he said smoothly, "that our study and practice schedules, which we must not relax—you understand—will prevent us from participating. Besides, we really do not want to get under foot. If you don't mind, we shall take our first two meals of the day in our suite; so will Elmir. Indeed, he can serve us, which will spare your people the necessity. But we would like to join all of you at dinner, after which perhaps you would like to hear our music?"

"That'd be fine," Björn answered, weighing the advantages of not having to integrate them—Borrianu especially—into the ship's complement against the lack of unity and, quite possibly, the security problems this might entail. "But there's one more thing. When we have first time passengers aboard, we always take a short shakedown cruise in the Null Zone before heading on out. That's so we'll get to know each other in Gilpin's Space."

Again Rebecca started to reply, and

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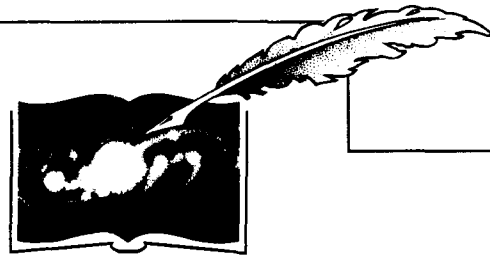

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— *Algis Budrys*

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again Jelk cut her off. "I'd very much like to," he said, "but we do have a problem—our schedule on Earth. We are anxious to experience as much of the Far Reaches as possible. Elmir and I are the only first timers, so could we not forego this?"

Rebecca put her hand on his. "Anders, I promised Burton we'd check in at one Legion outpost at least. He'll expect word."

For an instant, Jelk's lower lip jutted obstinately; then, with a shrug, he yielded. "All right," he said, "but I'm impatient to experience what this supposedly fearful Universe has in store for us."

You'll find out soon enough! thought Björn.

After that, everything seemed to go smoothly. Björn kept *Lyra*'s speed down to a tiny fraction of its potential, and almost a day and a half went by before they reached the Legion post on an outer Null Zone planet some humorist had named Sidi-bel-Abbès, where the commandant, who had known Björn and Pardee for years, insisted that they stay at least for lunch, which Jelk wolfed impatiently.

That night, everyone was too busy to think of a recital, but on the second evening, with *Lyra* well into the Far Reaches, Jelk and Rebecca kept their promise. He and Borrianu brought the synthesizer and Rebecca's harp into the wardroom; and for more than an hour their music held everyone aboard entranced —everyone except Borrianu, who remained sequestered in his quarters. Suddenly now, they all understood what Björn and the Twopersons had perceived at the recital they'd attended: the reason for Rebecca's admiration for the man, the musician, and for her devotion to him.

She chose simple things: a piece by de Falla for one of García Lorca's Gypsy Ballads, composed originally for guitar and voice, and a lilting Irish song, *Eileen Oge*, and Scarlatti's *The Cat's Fugue*, and Couperin's *Soeur Monique*; and around her crystal notes, Jelk and his synthesizer wove their tapestries, their delicate traceries of melody, bright grace notes, clever little jests and small sad tears, and always without infringing on her domination of the thematic structure. As they played, Björn saw how Jelk was rising in everyone's estimation, and he told himself that, while he certainly deserved it, it was one more reason for *Lyra*'s captain to keep close watch on things.

When it was over, after Jelk and Rebecca had retired to their suite, Lee Twopersons was the first to comment. "Impressive," he said. "But does it tell us anything about how they'll react when the voices start hitting them? One thing I don't like, skipper, is their not showing up for breakfast. Hell, breakfast's the time for everybody to chew over the night's experiences. It's our group therapy—helps chase away the devil-devils."

"I don't think we need to worry about Miss Whitworth," Björn replied. "She's been out in the Far Reaches more than once. As for the other two, well, I'd say Jelk's anybody's guess, if that ego of his holds together, but I'd bet almost anything Borrianu'll crack and scream to be taken back to the Null Zone, or else—well, we'll just have to watch out for that or else."

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* * *

That first night in the Far Reaches was, comparatively, an easy one, through which such veterans as Björn and his crew slept almost undisturbed. The waves and sudden surges of terror and rage and anguish that reached them lacked the power to thrust past the guardianship of trained subconscious minds. In spite of that, Björn's first thought on waking was how his passengers had fared; and when, at last, Borrianu emerged to fetch their breakfast tray, he looked the man over very carefully.

But Borrianu's appearance revealed nothing. His clothing was, if anything, a little untidier than before. His skin might have looked a bit unhealthier and his muddy eyes more strained. At breakfast, naturally, everyone speculated what Jelk and Rebecca would have to say when, at day's end, they came to dinner.

Then dinnertime came, and they appeared. Rebecca smiled at all of them, and volunteered nothing. Looking at her closely, Björn wondered whether she had been weeping, but if she had then she had repaired the damage beautifully. Jelk was not changed at all. He was still self-assured, self-sufficient, remote.

"Well, how did the Far Reaches treat you, Mr. Jelk?" Björn finally asked.

Jelk laughed. "Captain, I had a good night's sleep, and though I can't say all my dreams were pleasant, they were by no means unendurable." His glance flicked at Becky, but she made no comment. He shrugged. "Poor Elmir was quite disturbed at first, but there was nothing with which even he couldn't cope. I trust things will get more interesting as we get deeper into the Far Reaches?"

"They *will*," said Lee Twopersons grimly.

"Good. Now tell me, please. Why is it you speak always of these phenomena as *voices?* The—beings—speak no words. They convey no real messages. Nothing is communicated but raw emotion, and even this is hard to understand because the emotions are so alien. Is that not so?"

"Alien, yes, but we experience their analogies," Björn told him. "If you are abandoned to a long and painful death, it doesn't matter *why,* or *what* abandons you, or even what strange meaning abandonment may have for you. But why call them voices? What else can we call them?"

"Has anyone ever tracked any of them down—I mean, to their worlds of origin?"

"Good Lord, no. I don't see how they could. Anyhow, who'd ever want to?"

Jelk closed his eyes. Again he smiled. "It would be very interesting," he said. "Scientifically."

Afterwards, Björn found himself wondering how Jelk, having now experienced the emotions that lacerated the Far Reaches, could possibly remain so blasé about it.

So the days passed, three, six, ten, each day like the one preceding it, yet each almost imperceptibly different. Rebecca and Elmir Borrianu were both changing. Her playing was still magnificent, but when she was not playing she sat in silence, and Jelk did all the talking. Her eyes, now, were deeply shadowed; new lines were forming round her mouth. At first, occasionally, she

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came alone to chat with Alicia Twopersons in the control tower when Alicia had the duty; now she no longer did so. Now it was Jelk who began to come out sometimes to chat cheerfully with Björn or have a drink in the wardroom with whoever happened to be there. As the days and weeks went by, it seemed as though, somehow, the Far Reaches were having a normalizing effect on him, turning him into a more social being. Had Becky been cheered by this, Björn would have been encouraged and relieved, but he was at a loss what to think, and the Twopersons were even more concerned than he. "Nothing's right," Alicia told him. "Rebecca's living on hope and self-deception. Even this schizoid husband of mine feels it."

"She is referring," Lee said, "to my three-times-great grandfather. Two Persons was his name, and I can assure you it had nothing to do with split personality. Had he known that I, his direct descendant, was to be the butt of my woman's crude joke, he'd probably have changed it to Semmelweiss or Snodgrass or some other paleface cognomen. Well, I guess I love her anyhow."

Björn laughed. Lee was enviably well integrated, as stable a personality as any skipper could ask for in the Far Reaches. So was Alicia. But Björn was beginning to wonder about himself. By now he realized that there was nothing falsely artificial about Rebecca's theatricality; it simply was part of her persona. She was totally honest, and he had come to admire, not only her talent, but her clear courage and her patience. And—well, now what would follow? He asked himself how much of a schizoid personality he'd have to develop to carry out the mission he'd undertaken, especially as the strains and stresses of the Far Reaches and of his relationship with her and with Anders Jelk inevitably intensified. He thought of his childhood in Iceland after his father's early accidental death, and of the uncle who had helped to raise him, a living treasure of Old Norse legend and history, who had known the Prose Edda practically by heart, to say nothing of the sagas of the heroes and the skalds. He thought of his uncle, and he remembered Kormák's Saga, and Kormák's mad, tragic, self-frustrating love for beautiful Steingerd. And he asked himself, *Could I, too, become a Kormák?*

At the end of the first week, they had sought the temporary relaxation of a null zone, that of a six-planet system Far Outers had already visited, where one world was essentially Earthlike, with vast, blue, breathing seas, saw-toothed continental spines, and wind-swept forests where great-eyed creatures dwelt. It was not a safe planet; the ship's sensors confirmed earlier reports that its life-forms were inimical to man, so they ventured out onto its surface only when securely suited. But during the two nights of their stay, they slept untormented, and for the first time in days Rebecca came out of her seclusion, alive with wonder at the long magnificence of its sunsets and sunrises, the roiling dragon-clouds that blazoned every color of the spectrum to attend the disappearance and rebirth of a huge red sun.

But to Anders Jelk a new planet was simply time wasted.

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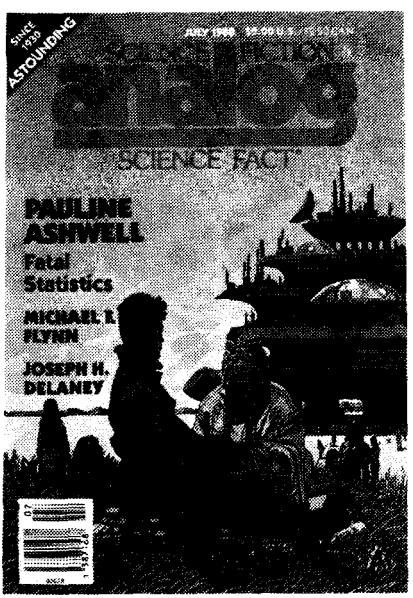

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protests, they visited two more systems and three more worlds, all previously unreported; and, as was customary with Far Outers, they had *Lyra* record everything: beings and artifacts on the one planet where primitive intelligence had evolved under an utterly improbable pale yellow sun, and—from normal space—the topography of continents and oceans, mountains and deserts and polar ice-caps.

And all the while, the shipboard tension rose, relieved temporarily in null zones only to reawaken once they were again unprotected. The tension rose, and now very gradually, almost imperceptibly, they became conscious of a change in the music Jelk and Rebecca played for them. More and more, the patterns he wove around her central themes were becoming statements instead of elaborations, sly criticisms instead of echoes and ornamentations. More and more, it seemed as though he was contending with her for leadership, for mastery. The whole tone of his music was changing; his listeners could feel a growing coldness, hardness, antipathy, difficult of definition but subtly frightening.

Something lying long in wait was at last emerging.

Each day, to Björn, Rebecca seemed more strained, wearier, her eyes more darkly shadowed. Her conversation, at the dinner table, was as inconsequential as she had kept it ever since she and Jelk had come aboard; she still deferred to him when, as he usually did, he took over whatever subject came under discussion; and her performances were as technically perfect as they had ever been. Watching her eyes, knowing with certainty that at night she wept, more and more often Björn found himself wondering whether to use *Lyra*'s spy-circuit, knowing it was justified but still despising himself for thinking of it. Obviously, Jelk was thriving. Just as obviously, she was not. Was that excuse enough?

All the while, whenever he appeared, Borrianu moved like a stick-figure among them, eyes bloodshot, hair and clothing increasingly disarrayed, muttering to himself. Björn spoke to Jelk about it, and Jelk merely laughed. "Elmir will be all right," he declared. "He still cannot always cope with his midnight visitors, but he's learning. I'm teaching him."

Then, toward the middle of their fourth week in the Far Reaches, Rebecca raised her hand at dinner and her loose sleeve slipped back. Her forearm was black and blue—and it was then that Björn decided to use the spy-circuit.

After the two of them had retired to their suite, he locked his cabin door and waited a long two hours. Seating himself at the controls, he activated the circuit.

And nothing happened. The screen remained blank. Either Jelk or Borrianu, both experts, had been at work. He waited, frowning; repeated the process, again with no result. Then he remembered the captain's emergency audio link to all parts of the ship, paralleling the intercom and almost never used. Carefully, making certain his own microphone was off, he switched to the owner's suite, first to the saloon, where there was only silence, then to each of the two staterooms. The first would normally have been a guest room, and to

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his surprise from it came the soft sounds of a woman's slippered feet pacing, back and forth, back and forth. He switched to the master stateroom, where he had expected to find Rebecca in bed with her jealous lover. He listened, and shivers ran up and down his spine.

A man was moaning incoherently. He knew it was Borrianu. And the moaning was punctuated by Jelk's voice and his low laughter.

Björn switched off, and sat at the console a long time, trying to puzzle out the scenario: just what *was* happening —and what could and should he do about it?

Next day, in the control tower, he talked it over first with the Twopersons, then with the McCurdeys.

"Björn," Lee said, "what *can* you do but wait? The way things are set up, unless you encounter overt violence, you can't do a damn thing till Rebecca screams for help."

McCurdey gave him the same frustrating advice.

Björn sighed. "I'd hoped one of you geniuses would come up with a really bright idea. As it is—well, we'll just have to take precautions we've never had to take before. Let's make sure whoever's on watch is armed, unobtrusively of course, and with stunners only. Also, we'd better bug access to anything vulnerable—our air and recycling systems, our drive, our nukepak."

"You sound," said McCurdey, "as if you expect the bastard to attempt a takeover. Piracy in the high spaces? Or would it be mutiny?"

"After what I heard last night," Björn answered. "It's safer to expect anything, no matter how improbable. Hi, you can handle the bugging, can't you?"

"No problem. I can make it look like routine maintenance. Can't guarantee it'll be Jelk-proof, though."

"I'm glad you're taking it so seriously," Alicia said. "Björn, the man is changing; the Far Reaches *are* affecting him. I can't tell you just how. All I know is it's for the worse. His music's changed—more and more often it hints of pain, of cruelty, and in spite of that it makes you *want* to listen. It's sick, Björn, and getting sicker."

For a long moment, they were silent, recognizing the truth of what she had, for the first time, put into words.

"Sooner or later," she continued, "something's got to give. He's still keeping whatever it is under control, but how long can he keep that up? How long will he want to?"

"Yes, yes!" whispered Raisa McCurdey. "It's as if he's transmuting our dreadful voices into music, and—and somehow making us want to listen to them."

Yes, thought Björn, *that's it.* He had felt it, too—and it had made him fear something in himself.

The days and nights wore on—two more, and three, and four; and now *Lyra* had penetrated as deeply into the Far Reaches as any ship had, at least any that had returned. Each evening, Rebecca and Anders Jelk performed for them, and now her music too had changed. Where once she had generally preferred the gaiety of the Baroque, the simple exultation of country dances, Mozart's pure delight, or at her most serious, simple songs of courage or de-

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fiance, now everything was dark, mournful, almost despairing. And yet each evening they listened, knowing they would want more.

So it was that on the fourth night, at her harp, she told them she would play Takeo Yoshida's monumental *Lament for Dan-no-Ura,* a threnody for the warriors who had perished at sea and ashore at the battle fought there nearly a thousand years before, the warriors and the courtiers, a dirge for the boy-Emperor Antoku Tennô and for the anguish of all those who had been overthrown, bereaved. Written originally for koto and woodwind ensemble, it was something not everyone could play, demanding an almost impossible degree of expertise. It spoke of war and wounds, of savage victory, of pain too long endured. The language it spoke was universal. Not only in Japan, but throughout the world, audiences wept when it reached its climax, overwhelmed by its sheer beauty, its tenderness, and the despair of the inconsolable.

She played superbly, and at first Jelk contented himself with an accompaniment, embellishing when the music evoked the clash of arms, emphasizing when it echoed storm and strife. Only very gradually did he permit his newly contrived intrusions to be heard, and even then, had Björn and the rest not been listening for them, they might have passed unnoticed. One emotional peak followed on another, only to be washed away by a fresh rain of silver notes, always building up the tension, the sadness, until, almost at the last, it became virtually unendurable, the harp weeping alone, the accompaniment muted.

Björn realized that he was holding his breath, that there were tears in his eyes. Beside him, Alicia was crying silently.

And it was then, at that peak, that Jelk brought his synthesizer to life terribly and abruptly. He ripped Yoshida's loveliness to shreds with a single shriek, a shriek compounded of a pandemonium of voices crying hatred, cruelty, the ultimate in pain. It was as swift and deadly as the slashing of a throat.

Rebecca dropped her hands. For an instant, she stared at him. Then, bursting into tears, she fled the room

Jelk laughed. "*That,*" he said, "is how it ought to be!"

He turned his back and strode out of the wardroom.

After a long moment, Lee said, "Looks like the son of a bitch is declaring war, doesn't it? Next few days ought to be pretty interesting."

"Björn, what d'you figure we ought to do?" rumbled Petulengro, flexing his massive forearms.

"Nothing's really changed, Jim." Björn's voice echoed his anger and exasperation. "Until Miss Whitworth comes out and asks for help, or until Jelk or his stooge pulls something rough, our hands are tied. There's nothing we can do."

They talked about it a while longer, getting nowhere. Then the group broke up. Petulengro opened the piano and started playing Viennese waltzes. The McCurdeys danced together, and Alicia tried to entice Björn onto the floor. Presently, he made his apologies and went off to his quarters. He had been there only fifteen minutes when his intercom buzzed.

It was Rebecca. "Björn," she began without preamble, "I'm asking you a

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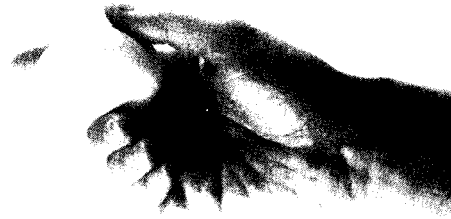

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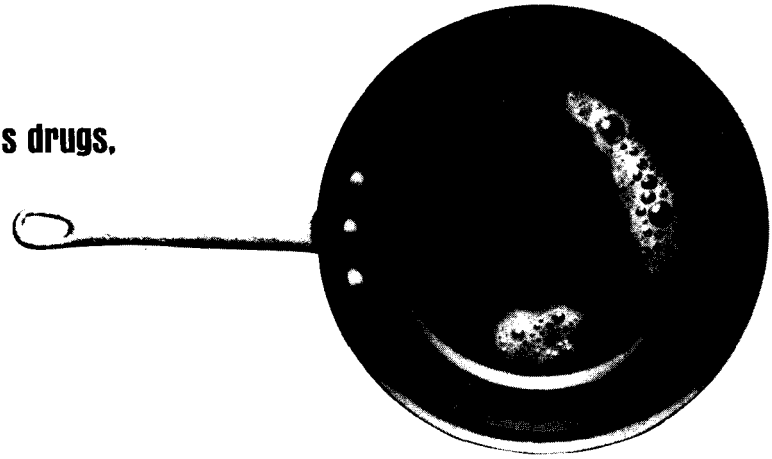

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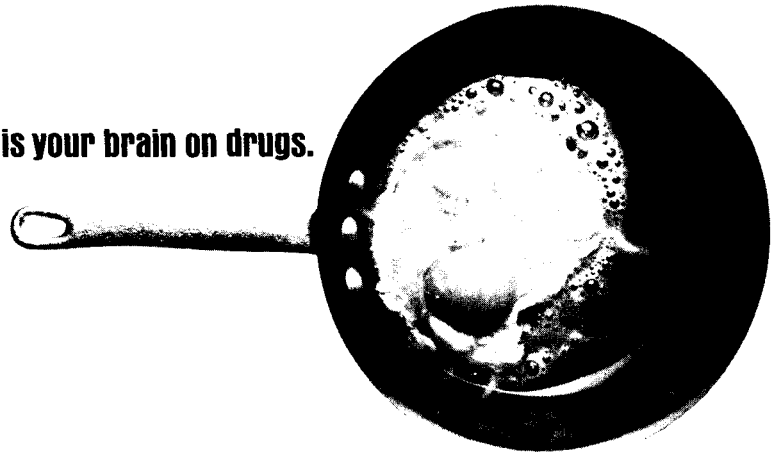

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favor, a very hard one probably. Please, *oh please—*" She struggled to keep her voice under control. "—no matter what you thought—what happened—what Anders did, *please* say nothing to him. Please pretend it never was. The Far Reaches have done things to him, Björn, b-but I still don't know what, and—and I still hope."

"I made you a promise, you and your uncle and Burton Pardee, and that promise I intend to keep. I'll take no action unless you ask me to, or unless—"

She said almost inaudibly, "*Or unless—*?"

"Or unless I am compelled to."

She thanked him, crying audibly, and hung up, whispering her goodnight.

Björn, knowing that sleep would elude him for a time at least, rejoined the few still in the wardroom.

IV.

Afterwards, before he went to bed, he checked the audio several times, learning little more. From Rebecca's room, there was, for a time, the same pacing back and forth, and occasionally a muted sob. From Jelk's an interval of snoring, then Borrianu crying out, moaning, pleading with Jelk in a language Björn didn't understand, then a hard, sharp slap and Jelk's laughter.

Next morning, even more bedraggled and exhausted than before, Borrianu went as usual to the galley to get breakfast trays, but now, where before Jelk and Rebecca had shared a tray, he asked for separate ones. The day passed with no other sign. Then, at dinner, Jelk joined the rest of them alone, smiling sardonically, acting as if nothing unusual had occurred.

"Where is Miss Whitworth?" Björn asked, keeping his voice level. "Isn't she feeling well?"

"She is angry with me," Jelk answered, "because last night I indulged in a little self-assertion. Ever since we first became associated, she has been used to dominating our music, as you perhaps have noticed. She did not seem to realize how much your Far Reaches and their voices have changed me, that I no longer need to be dependent on her. I thought it time to teach her that this is at an end, that from now on, it will be *I* who leads."

Petulengro snorted under his huge moustache.

Jelk turned on him instantly. "You do not think this nice of me?" He sneered. "Perhaps you are a musicologist?"

Seeing Björn's frown, Petulengro shrugged. "I am not judging how you play your music," he said.

"You shouldn't. Soon you will understand that not only Anders Jelk has changed, but music itself has. From now on, music will never be the same. *Listen!*" He stared at them across the table. "I was right about what has barred the Far Reaches to most men, and now I have the power to set it right—the power to arm the human race so that we may seize our splendid heritage!"

"And how do you propose to do that?" Björn asked.

"I shall not bother to explain it. When Becky and I give our next recital, you will understand."

The rest of the meal passed in almost total silence.

"I gather there'll be no recital now?" Björn said, as Jelk rose to leave.

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"No, she's too—shall we say *upset?* But she'll straighten out. After they've learned their lesson, women always do."

When he had disappeared, Petulengro shook his head at Björn. "Christ Almighty, skipper! Isn't there some sort of space equivalent for having a guy walk the plank?"

"Being popped out of the airlock," McCurdey said.

Sitting there, Björn felt the intensity of their frustration, how much they detested Jelk and feared him, not just the man himself but his new alienation.

That evening, of course, there was no recital; nor was there on the next. Very tactfully, Alicia Twopersons had called Rebecca on the intercom, not prying, but asking if there was anything she could do for her. She had been told that, no, no one could do anything. Borrianu would bring her dinner. Perhaps in a day or two—

And again at dinner Jelk had laughed and said that in a day or two she'd be having second thoughts. But the third day and evening passed, and she still did not appear. Once more, Björn talked to her, and once more she made him promise to do nothing.

Worried, harried by more than the voices of the night, he slept fitfully, and, at about two-thirty, woke abruptly, knowing his mind had been assailed by something infinitely more powerful than anything in his experience. Somewhere in the illimitable distances bridged by Gilpin's Space, *something*—no, not a single something, a hive, a city, the entire population of a planet—had suddenly faced its own inevitable and terrible death, screaming out the emotions that sundered it, at its own utter helplessness, at—God only knew what. Björn sat up in bed, shuddering, forcing himself to shake it off. He knew that sleep now would be impossible, that soon his intercom would start buzzing. He got up, made coffee. During the next few minutes, Alicia Twopersons called him; so did Petulengro and Salazár. The others had already talked with them. Their anxiety was not for themselves and not for him. Instead, all were concerned for Becky, and how the impact may have affected Jelk and Borrianu.

He drank two cups of coffee, and wondered, in spite of himself—for he knew the futility of it—what kind of cosmic tragedy had been responsible.

At twenty after three, there was a soft knock on his door, twice nervously repeated.

"Who is it?" Frowning, he drew back the bolt.

"Oh, Björn, Björn, it's me! It's Becky. *Please* let me in."

He opened the door quickly, and as quickly she darted in. "Bolt it! *Please* bolt it!" she whispered.

Björn bolted it, and guided her to his own chair. He poured her a cup of coffee, another for himself.

"You felt it?" he asked gently.

Her face was ashen. Her hair floated loosely down; her whole appearance, even so, was still Arthurian in the Burne-Jones mode. "Y-yes, I felt it! Oh, I did!" She raised her hands as though to shield her eyes. "It—it was *hideous*, but Björn, that wasn't all. I—I pulled myself together. Then I began to wonder how it had affected Anders and Elmir." She dropped her hands. "Björn, I have to tell you. Anders and I,

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we—we've not slept together since we entered the Far Reaches. I let him take the master stateroom so he could have Elmir there with him on a cot, and I've been using the guest stateroom. So—so I put on my robe and went through the saloon. I'd thought of knocking on his door just in case. And for the first time, because he hadn't bolted it, his door was open—only a few inches, but enough for me to see. I pushed it open all the way. There was enough light, more than enough." Suddenly, there was hysteria in her voice. "Björn, Anders was lying there in bed, and he had not wakened! *It hadn't wakened him!* And I could see the expression on his face. It was one of ecstacy, sexual ecstacy. *Björn, he was feeling it, enjoying it!* And he had tied Elmir to the cot, tied him hand and foot. He'd—he'd boasted that he'd train Elmir to listen to the voices and—and to become immune to them. Elmir is someone I never thought I'd feel sorry for, but now I do, I do. Anders is using him as an experimental animal!"

Tears were running down her cheeks, and she fumbled at them. Björn handed her two tissues. "Drink your coffee, Becky," he said softly. "Did Borrianu see you? He at least must have been awake."

"Yes, yes he did. I don't know what I hoped to do, but when I started to walk in, he shook his head so desperately that spittle flew. I realized he was too frightened to call out to me, and that he feared my entering the room. So I backed out, and—and—" She laughed, a shrill, gasping, choking laugh. "And here I am! Oh, Björn, Björn, I *can't* go back in there. Let me stay here tonight, here with you." She rose and came to him. "Björn, please hold me, just hold me. only that."

Silently, chastely, he took her in his arms, and held her, saying nothing, while she wept silently on his shoulder.

Presently she went to sleep; and later, much later, he slept, too.

Next morning, when he woke, she was still there, beside him in the bed, his arm enfolding her. Quietly he rose, realizing she should sleep as long as possible. He shaved, dressed, and finally wakened her.

She woke slowly, puzzled for a moment. Apparently no other voices had disturbed her sleep. She took his hand, smiling a little. She kissed it. "Thank you, Björn. You've been kind and understanding. Today, I'll have my things moved to a spare cabin—I know we have one."

"Of course," Björn said, quelling the disappointment in his voice, telling himself he had no right to be disappointed, no more than any other Dutch uncle, reminded again of Kormák and the lady Steingerd. "I'll talk with Jelk, and arrange for people to bring your gear."

"Yes," she said, "I suppose you'd better talk to him. I can't. Our—our life together was our music, his and mine, and I loved him for it. Now I know he's incapable of love, and still I can't understand it—how a man capable of such music can be so empty of humanity. It's all over now, and I feel as though I too am all ice and emptiness."

"Many great artists have been cruel, unpleasant men. Brahms was pretty much a sadist, and there've been others. You have your own music, Becky, your own soul, your own career. All that

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could have been destroyed by what Jelk is, by what he has become."

"I know," she said, "and yet—well, if you hadn't sheltered me last night I'd probably have made one more last try with him—and that, that would have meant complete surrender." She shivered as she said it. "Thank you, Björn."

"Let's go to breakfast, Becky," he replied. "I'll call him afterwards."

At the breakfast table, no one so much as raised an eyebrow. They smiled at her as she sat down, and she did her best to smile back. After a while, Björn told them very briefly that Anders Jelk had been so changed by the Far Reaches that she could no longer maintain their relationship, and would Alicia show her to the vacant cabin next to her own?

Breakfast over, he went back to his cabin and called Jelk. Borrianu answered. He was ssorry, very sssorry, but Mr. Jelk was now practicing. He could not be disturbed.

"Well, I *am* disturbing him," Björn growled. "Tell him the captain is coming to his cabin immediately, on ship's business."

"B-but—"

"Goddamn you, Borrianu, don't argue! *Tell him!*"

"But he—he will be very angry!"

Björn did not answer, and presently he heard Borrianu leave the intercom and speak to Jelk, the muted voices of the synthesizer in the background; he heard Jelk laugh contemptuously. Then Borrianu was back. "Mr. Jelk says he will give you perhaps five minutes," he said, sounding frightened.

Björn switched off, strode to the owner's suite, walked in without knocking. In the saloon, Jelk was seated at the synthesizer's console. He kept on playing, paying no attention, and his music was like nothing Björn had ever heard before. It *was* music, certainly, but only too clearly, to anyone whose sleep had been invaded by them, it echoed the dreadful voices of the Far Reaches.

"Stop it, Jelk!" Björn ordered. "It's time to talk."

Jelk thrashed out a screeching string of atonalities and stood. Abruptly, he was smiling. "Well, Captain Ricardi," he said, "so now you have my Becky, have you not?"

Björn looked at him, and in his mind's eye suddenly saw the two of them, armed and helmeted, facing each other with their war-axes in the Iceland of another time.

"Is that why you have come, to tell me that? Or is it that she has sent you to intercede for her?"

"*Neither*," said Björn.

"Well, that is good, but as far as I'm concerned, Captain, you can have her—slightly shopworn, of course, but with my compliments. Do sit down. We can talk more comfortably. No? You don't mind if I do?" He dropped into an armchair. "I shall make the situation very easy for you to understand. I no longer need her. I no longer need her music, for finally—the gift of your Far Reaches—I have my own. And I no longer need her ship. I was right, you see, about your voices. They belong to the weaklings of the Universe, and the fact that you brave Far Outers are troubled by them shows that you too are weaklings. Captain, the *strong* remain untouched by the whinings of the weak.

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We feast on them. Do you remember ancient Rome? *They* were truly strong, and all their citizens, once they had had their taste of blood, revelled in the agonies and despairs and futile rages of the colosseum—and not just the colosseum but in the countless forums they built throughout their Empire. They combed the world for slaves and captives, for savage beasts, they established schools for gladiators—all so they could delight in the pain of those weaker than themselves. That is how I regard those voices, Captain. I have enjoyed every night in the Far Reaches, last night most of all. Now I have disciplined my mind so it does not automatically tune them out when I awaken. Is that not wonderful? And what I now intend to do—what I have already started doing—is to compose music that will give the human race its taste of blood. I know you have already noticed this—and that each of you has wanted more. Is that not true?"

"Yes," Björn answered, "and we're ashamed of it."

"Then what do you think it will accomplish when it is introduced into the music young people listen to, at the age when they literally worship their noisy entertainers? Their displays of savagery during the worst days of punk rock and the even more primitive fads that followed it will seem mild by comparison. Can you imagine, Captain, whole crews drunk on the sufferings of the universe? *That* is how I shall arm mankind to conquer it! Look at Elmir here. Even he, before I'm through with him, will be able to sleep serenely through the worst of it. Won't you, Elmir?" Borrianu dropped his eyes. "I—I think so, yess."

Björn stood there, realizing with a shock that Jelk very possibly had the ability to do what he planned. He could not turn all men into monsters, possibly only a fraction of them—but how many? More than enough, certainly.

"Jelk," he said, very deliberately, "you're insane. I ought to—"

Jelk interrupted him. "Don't say it, Captain. Perhaps you think you ought to push me out to die in space, or leave me on some desert world, or simply kill me? But of course you will do none of these things, because you *are* a weakling, because you have promised Rebecca's uncle and your friend the colonel that you will bring Anders Jelk back safely, because you fear the consequences to her, to them, and to yourself if you fail. Is that not right?"

He didn't wait for Björn to answer. "Well, you need not worry about Anders Jelk going back to Earth. I am not going there. You shall take me and Elmir to the planet Lassa, where my message will be enthusiastically received—it is what Man Triumphant has been waiting for. And if you feel that you have triumphed over me, that you have robbed me of my woman—well, it is as I said. Even if she begged to be taken with me, I'd refuse. On Lassa, there will be women whose thinking is like mine, strong women who can give men like me strong sons who will grow up to be conquerors."

"Mr. Jelk," Björn said, very evenly, "I am *Lyra*'s captain, but Rebecca Whitworth is her owner. Where this ship goes, where you go while you're aboard, will be *her* decision."

Jelk's lips tightened. "She will take

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me where I want to go. And now, Captain, Elmir will show you to the door."

Once in the wardroom, Björn forced himself to relax. Then he joined Lee and Alicia in the control tower, and gave them a brief account of what had occurred.

They were not surprised. "I think we ought to take his threat seriously," Lee told him. "Morally, he's a monster—but it's true that musically he's a genius. It's very possible that he can do exactly what he plans to do. He ought never be allowed back on Earth, back among men. And don't tell me music can't have all that power. Where would Hitler have been if Wagner hadn't helped to waken the old gods?"

"Björn, it's not simple," Alicia said. "What he said about your promises and all our ties with Earth is true. Maybe it'll be necessary for you to make a hard decision you do not want to make, but please don't do anything too hastily. There are other factors operating."

"Such as—?"

"Such as Borrianu. The Far Reaches have done things to him, too, Björn. He's not quite the slippery, slimy creature he used to be. Oh, he's still weak, still cowardly, perhaps still venemous. But his look, every time he's come to the galley lately, isn't the same. Now there's more than fear and spite—there's a yearning, too, vague and unfocussed, but it's there."

Lee snorted. "I hope you're right."

"I'll have to talk it over with Rebecca," Björn told them. "Her years with Jelk are still with her. That's not to be shaken off in a few days. In any case, we'll start back to the Solar System now. Staying out here would only give Jelk more fun in bed. We've half a galaxy to cross, so even at all-out speeds we'll have some days to make up our minds—*my* mind."

"And in the meantime?" Lee asked.

"All the security measures we can dream up. Hi can make sure *Lyra* goes into a full-record, no-wipe mode." He smiled, but there was no humor in it. "We'll be getting nothing from the owner's suite from now on, at least directly, but we'll have the rest. We may need to prove this or that."

To his surprise, Björn ran into Jelk at Rebecca's door; he had tried the handle and was on the point of knocking. "Well, Captain," he said, "Have you come to see our girl friend? As you can see, I am ahead of you, so possibly you'll come back later?"

"No," Björn answered, "I shall not. I shall see her now, and you shall not see her at all. Becky's off-limits to you, Jelk."

Jelk bared his teeth. "Do you think *you* can stop me, Captain?"

"I can and will." Björn drew his stun gun. "I'll stop you very effectively, and you will remain in—shall we say stasis?—for about an hour. However, we'll move you to your room, and Borrianu can care for you till you come out of it. Maybe our voices will sing to you."

Jelk stared at him unbelievingly. "You fool, do you imagine you can use violence against me and get away with it?"

"I can," said Björn flatly. "Jelk, it's true you have me by the balls—but here aboard ship *I* have *you* by whatever you

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have that corresponds to them. Let's suppose you successfully assault me or even kill me—which I expect you'd like to do. You'd have no chance against my crew, and back on Earth you'd only have made a prime monkey of yourself. If you don't behave, and if you ever try to pester Becky, you'll get turned off like a busted robot."

The color had drained from Jelk's face; his knuckles had gone white. His mouth opened, snapped shut. He whirled and strode away.

Björn knocked on Becky's door, called out to her.

She opened it, gestured him to a chair. She had been seated at her harp; now, catching his glance, she said sadly, "Yes, I was playing, extemporizing, just talking to myself."

Björn took it as a good sign; at least she wasn't surrendering to apathy and despair. He proceeded to tell her everything in detail, omitting nothing, knowing none of it could hurt her more than she already had been hurt.

When he had finished, "Isn't it strange?" she said. "That dreadful jealousy, and then—then when he knew he needed me no longer, this sudden change? I really had to have my nose rubbed in it, didn't I? Do you know that all the time I was having breakfast and lunch alone with him, it was part of pretending nothing had changed between us?" She shook her head ruefully, and her heavy glowing braids caressed her breasts. "And now he wants us to take him to this planet Lassa? What do you think?"

"I think we'd be running a great risk, Becky. As you know, several Far Outer ships are supposed to have vanished there. Those Man Triumphant colonists are hostile to us, and even if, before we land, Jelk gets us a safe-conduct, I'd never trust it."

"Then I suppose we'll have to take him back to Earth?"

"It's either Earth or Lassa or—well, we'll have to give more thought to just how much danger he may be, not just to us, but to the human race."

She stared at him, wide-eyed. "Björn, as a musician, as a woman, as a human being, I *know* he can do what he's been threatening. He's already doing it. I've recognized how his music can compel that cruelty which still—God help me!—persists in all our hearts. I *know* this. And yet, Björn, the alternatives still frighten me. There'll be no way to stop him without violence. You know that."

"Our dilemma has sharp horns, hasn't it?" he said. "I'll talk to all the others. Maybe together we can come up with something."

They talked it over, and though—in deference to Rebecca—no one was too explicit regarding what should be done with Jelk, the kindest sentence any of them would have pronounced would have been banishment to an infinitely distant, uninhabited, barren world where he could have added his voice to those that haunted the Far Reaches. Alicia alone objected, "There's no way we can decide now," she said. "We don't know enough. We understand Jelk, true. But do we understand Borrianu?"

"What difference?" grunted Petulengro. "Look at the guy. He's a wreck. Today, when he picked the tray up, it was like he'd spill every bloody thing on it, the way his hands were trembling."

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"I agree," Lee put in. "There's nothing there."

"I told you, Lee—" Alicia was obstinate. "—he's been changing. Twice now, in the galley, I've been sure he was at the point of trying to talk to me—trying to screw up his courage to. Another rough night, and who knows?"

"At first I had sort of a hunch he'd be useful," said Björn. "But now—well, I don't know. Let's just hang tough for a bit before we have to decide."

Rebecca looked at him gratefully.

V.

That night was rough, as rough as any they had experienced, and Borrianu, when he came for Jelk's breakfast, had looked more than ever like a corpse dreadfully and haphazardly reanimated. His eyes were dull black pebbles in sunken pits. He was unshaven and seemingly unwashed.

"We'll hear more from him before this is over," Alicia said, and Lee, shrugging, didn't contradict her.

Somehow, in mid-afternoon, when Rebecca heard a faint scratching at her door, she knew instinctively who it was, and was not astonished.

"Yes?" she said.

And the expected answer came, in a whisper. "Misss Whitworth. It iss me, Elmir Borrianu."

Becky unbolted the door, opened it. Darting a glance over his shoulder, he slipped in.

"Did Anders send you?" she asked.

"No, no," he answered, working his hands. "He does not know. He must not know. He—he would kill me. Please, please bolt the door."

She bolted it, pointed to a chair.

He perched on its edge, still fearful. Then the words hissed out of him. "Miss Rebecca," he cried out, "you must believe what I say, yess. I have been with Anders Jelk now nine years. All those years I served him because I was weak and cruel, and he is cruel and strong—oh, sso strong! I wanted to be like him. I did everything he told me to for him and Man Triumphant. Misss Rebecca, twice I have killed for him. I have murdered people who were in his way, a man, a woman. A month ago I would have killed even you if he had told me to." He shuddered. "And always he has said, 'Borrianu is my dog. I tell him to roll over and play dead, so he rolls over, belly up.' And I would only nod and smile as if he paid me compliments. But all that was before—before we came into these Far Reaches, before I felt the voices." He covered up his face, rocking back and forth. "Miss Rebecca, he lies there with his eyes closed, and sometimes he records notes of music, his new music. Each night he has tied me to my cot, as you have seen. When I could not sleep, he forced me to take sleeping pills, which made it worse. When I tried to plead with him, he beat me. 'Elmir,' he kept telling me, 'before we're finished you'll be as tough as I am.' Then he would damn me for a coward."

He dropped his hands, wiped his eyes with the hairy backs of his hands. "But he has failed, Misss Rebecca! The Far Reaches have done to me what you had hoped they'd do to him. Never before did I understand that other people, other beings, could suffer. I did not even imagine the truth of it. But now I *know*. I know, and I am ashamed of the things

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I've done, things I never can undo. I cannot live with myself, my memories. *H-how can I?* And when I think of what Anders Jelk now plans—Misss Whitworth, listen! He must not be allowed even to start! Think how he can infect Earth's children, its young people! Perhaps you'll say that he is simply mad—but that is not what the people of Man Triumphant will say of him. He will be a hero. They will do all they can to make certain he succeeds. That is why—" Abruptly he leaned forward. "—that is why I ask you and your good captain to take him to their planet, Lassa."

"To *Lassa?*"

"You are surprised? Of course. You know that Lassa is a danger to all Far Outer ships. But there are good reasons for what I say. Listen! I will tell you why Lassa is the only place where we can be sure that he is stopped. On Earth, on any other world, he will be on his guard—"

He broke off, staring at her with his worn-out eyes. "Look, Miss Rebecca, look at what Anders Jelk has done to me. Even so, it is I, Elmir Borrianu, his dog, who can stop him."

"Go on," Rebecca said.

It took him several minutes to outline his plans, and even before he left, thanking her profusely for listening, she had made up her mind.

"Thank you, Elmir," she told him. "I'll have to talk it over with Captain Ricardi, and I hope he'll go along. We'll see. And now, will you be all right? Will Anders suspect anything?"

"I shall bring him coffee from the galley, and brandy from the wardroom. That will explain why I have been out, but if he is still listening and composing, he probably won't even ask me. He is trying to gather as much material as he can. Goodbye, Misss Rebecca."

"I'll talk to you tomorrow when you come to the galley," she promised him.

She closed the door behind him, bolted it, sat down beside her harp, touched its strings soundlessly. For minutes, without a sound, her tears flowed. Then she dried her eyes, freshened her appearance, and called Björn on the intercom. Would he be in during the next few minutes?

Björn told her that of course he would. So, holding herself very tall and straight, she went to the captain's cabin.

He welcomed her, wondering at the look of absolute determination on her face. "What's happened?" he asked.

"I think, Björn, that Elmir Borrianu has brought us the solution to our problem. I hope so."

His brows lifted, but he said only, "Fill me in, Becky."

She recounted her talk with Borrianu in detail, being careful to add nothing and leave nothing out. Björn didn't interrupt her.

"This is what he wants us to do," she said finally, "to take them both to Lassa. He knows how dangerous it is to land there, but he says there's a United Nations presence on the planet and that we can minimize the danger by landing in their compound. Anders plans to radio them from orbit to arrange a landing, and we'll pretend to go along with this, then pop out of Gilpin's Space at the UN. Anders will object, naturally, but he'll soon see he has no choice—he can go under his own power or be car-

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ried out in stasis. Anders's synthesizer and their luggage can be unloaded by our people, and they themselves will follow immediately. Then, as soon as they touch ground and the plank's in, we shift instantly back into Gilpin's Space. After that, it'll be in Elmir's hands and the UN's."

"Becky, we'll be buying a pig in a poke!"

"I don't think so, Björn. Elmir says the UN staff on Lassa is primarily investigative, not all of them favorable to Man Triumphant. We can check *Lyra*'s data banks on that. Besides, he promised me that everything Anders already has composed will be wiped totally before they leave the ship—something he can easily do. And besides—well, he has something else up his sleeve. It will depend on you. The decision will be yours."

"And that is?"

She told him, and he drew in his breath sharply.

"If I weren't convinced he's being honest with me," she said before he could reply, "I wouldn't ask you to consider it. But he says he's already reactivated the snooper circuit in the owner's suite, and that can be checked immediately. Anyhow, I'm not the only one who thinks the change in him is real. Ask Alicia. Besides, what alternative is there?"

He stood there while danger rang its bell. He thought of his own original strong hunch and about how lately he'd been doubting it. He thought about the risk and tried to weigh his options. For a long moment, he simply looked at Becky. Finally, "We would have to take every precaution we can think of," he told her. "And for the time being, we shouldn't say a word to anyone, not until we're almost there. We can't risk anything that might make Jelk suspicious."

Lyra, like all Far Outer vessels, had defensive lasers in turrets fore and aft. *I can put Petulangro on one of them,* Björn thought, *maybe Salazár on the other. They may be tempted to take out Mr. Jelk while they have a chance, but I think not. They won't want to make that much trouble for us. As for the rest, I can handle it, or perhaps Becky—that might be better—at the last moment.*

"Then you agree?" said Becky.

He nodded reluctantly.

There were only two more days to go before they entered the Solar System's Null Zone, and they were anxious ones for Björn. As soon as Becky left him, he had tried out the spy circuit and found it once more alive, but there had been little to listen to except experimental snatches of Jelk's music. Later in the day, however, he listened while Jelk raved at Borrianu, boasting of how he was going to sweep away all mankind's compunctions, how he was going to liberate the race of man to seize its fearsome destiny. He instructed *Lyra* to record everything except the music, and to alert him whenever a conversation was going on. That night, as usual, he heard Jelk tormenting Borrianu. It seemed impossible that the man could slyly be playing a part; the shocking change in his appearance belied that.

Saying nothing about the crux of Borrianu's plan, he discussed the situation with his crew, and found mixed reactions. Some were apprehensive, du-

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bious of the change in Borrianu, much alarmed by the prospect of Jelk and his music being turned loose on an unsuspecting world. Petulengro and Salazár came out openly for marooning him or, better yet, having him walk the plank. They argued it back and forth, and ultimately, like all Far Outer crews who had been long together, accepted Björn's decision.

"Skipper—" Petulengro put it very simply. "—at this stage, the only real risk *we* run is in those few minutes when we land on Lassa, and if it's a surprise landing in UN territory that'll be minimal. It'll be you and Rebecca who'll be catching it if things go wrong and there are repercussions. I still think it'd be better to wipe the guy."

Alicia was sure the decision was the right one, and there were no more disagreements. Rebecca had spoken to Borrianu, and it was understood that from then on there would be only a minimum of contact between them.

So Björn waited. *Lyra*'s data banks, as complete as a ship's could possibly be, gave him all the information he needed about the UN presence on Lassa. Such a presence was obligatory whenever a new colony requested financial aid from the organization, but Lassa had not welcomed it and had given it no cooperation. The deputation was a small one, headed by two superpower figureheads, but staffed almost entirely by "harmless" neutrals: Swedes, Irish, Nepalese, Brazilians. Hopefully, they could be counted on to be unbiased witnesses when *Lyra* landed and decanted her passengers.

At the request of the colonists, the mission had been situated as far from their capital city as possible, halfway across their world, on a large blob of an island set far out in their dark, uneasy ocean. *Lyra's* banks had photographs of the buildings and of their compound, again some distance from the only major settlement, a miserable town whose main industry was fishing. Nearby was what was listed as a "military or police outpost"—something that boded ill for those Man Triumphant didn't like, probably placed there as a hint to UN personnel not to take their jobs too seriously. Björn noted that the planet had three small moons, all in fairly close orbit. He decided that, when the time came for Jelk to call his friends, *Lyra* would set down on whichever moon happened to be more or less over the capital, lending credibility to any arrangement he might make. Then, once more in Gilpin's Space, he'd head for the UN compound, land without warning, and—well, if Jelk didn't like it, he'd be unceremoniously unloaded with his luggage.

Björn made sure that every word spoken by Jelk and Borrianu, and every decision of his own and Becky's, was recorded and made a part of *Lyra*'s log, but at night, lying in bed, he wondered how it'd all work out and, even if everything went well, what role—if any—Becky might play in his destiny, and he in hers.

On the last evening before their arrival, Jelk astonished them by showing up for dinner, Borrianu at his side. The frozen silence that met him bothered him not at all. Even when he was shown to a small table apart from the others, he only laughed.

Björn started to get up, to tell him once again that he was out of bounds,

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but Rebecca, next to him, touched his hand and whispered, "No, Björn, that's what he wants. Ignore him."

Throughout the meal, then, Jelk boasted of what he had accomplished, and the uses he would put it to. They ignored him completely, continuing their own conversations in normal voices even when he tried to shout them down. When he and Borrianu were leaving, he turned and spat contemptuously on the floor.

Nobody reacted.

Jelk did not appear for breakfast, Borrianu coming to the galley for his tray. If he had slept, he showed no sign of it. Waiting for the tray to be made ready, he spoke to Becky privately for a few moments, the two of them going around a corridor corner out of sight. When she rejoined Björn, she said simply, "All's well," and took her place at the table.

Lassa was now only a few hours away, circling its angry sun with its family of planets, one or two of them pygmies, one or two huge gas giants. Björn, in the tower, thought of the strange perspectives men acquired traveling Gilpin's Space and especially its Far Reaches, where uncounted light-years could be traversed in less time than it had taken aircraft to fly from continent to continent. So accustomed did they get to such velocities that periodically they'd waken—fearfully, sometimes in shock—to the full realization of the distances involved. From the ports, he saw the gradually brightening image of Lassa's star, flaring angrily like a Gilpin ghost. Presently, Becky joined him. "Is everything prepared?" she asked.

"Everything," he answered, doubt momentarily assailing him. "And you?"

"I have it ready."

Silently, then, they watched the alien world take shape. Now a pallid sphere, they knew that from normal space it would be dark, its many seas far darker than the Earth's, with deep, sullen blues and greens, and huge brown sargassos of floating weed. *Lyra* had shown it to them, a world of continents shadowed by strange vegetation, greens so dark that they were almost black, raw umbres, ochres, clustering around cliffs red like open wounds and on every continent, wide, slow, oily rivers snaking through the eroded land.

Presently, they put down on a small, pitted golf-ball of a moon, on its near side, where they could see all of Lassa looming in the sky. They did not shift out of Gilpin's Space, not yet.

"Hell of a place for a race of conquerors," Björn remarked. "Let's get Jelk up here to place his call."

"Yes," Becky said, "and keep him up here a while, if we can. Elmir may still have things to do."

Björn nodded, called Jelk's state room. "We're down," he said. "When you get up here, we'll shift into normal space so you can call your friends."

In moments, Jelk appeared. He strode up to the ports. "Well," he said, "I see you had sense enough to choose Xerxes—that's the moon we're on. It'll make it easier for me to get through directly."

"That seat there," Björn pointed. "Tell me the frequency and I'll set it up for you."

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Jelk hesitated, then gave the frequency. Björn passed the word to *Lyra*. "Use a narrow beam," he said. "Mr. Jelk may want privacy."

Jelk muttered something unintelligible, but made no objection. A red light glowed.

"Ready," *Lyra*'s voice said, and Björn snapped her out of Gilpin's Space.

Instantly, where Lassa's Gilpin-ghost had floated, the great, lowering mass of the planet loomed in all its vast, dark solidity, scarcely relieved by even darker storms and tattered clouds. Even after all the planet-falls Björn had made in his space-faring, he still found it almost overwhelming. Jelk did not even look at it.

A second light glowed. "Identify!" a harsh voice ordered.

"This is Anders Jelk." He added a swift string of numbers and letter-combinations which Björn guessed identified him as one of the faithful. "Chloris is expecting me. So is the Captain-General. They know I am a passenger on the Far Outer ship *Lyra,* owned by—" He smiled savagely. "—by my one-time accompanist, Rebecca Whitworth. I will land with my servant, Elmir Borrianu, also a member."

A few silent seconds passed. Then, "You are cleared, Mr. Jelk," the same voice said. "Land at our headquarters. Direct the captain of the ship."

"I have been asked—" Again the smile. "—to arrange a safe conduct for the vessel and her people."

"You have it. How soon will you land?"

"Minutes only," Jelk answered. "We are on Xerxes."

At once, Björn flipped *Lyra* back to the security of Gilpin's Space. "You'd best get ready at the gangplank," he told Jelk. "We'll stay just long enough to drop you off."

And, he thought, *just long enough, if you had your way, for your supermen to board us, or at least try to cripple us with a disabling missile. Well, it's not going to work that way.*

Jelk bowed mockingly to him and to Rebecca. "Enjoy each other," he said, and left the tower.

Björn called Petulengro on the intercom. "Everything ready, Jim?"

"Ready," Petulengro answered. "Salazár and I'll stand ready to heave their luggage off ahead of them. They'll probably be carrying the synthesizer out themselves."

Minutes passed, and suddenly Jelk was once again at the control tower's door, white with rage. "What's taking you so long, idiot?" he demanded. "We should've been down and unloaded by this time. Even if you don't know where our HQ buildings are, your damned ship does. What are you trying to get away with?"

"Whole skins, Jelk." Björn grinned grimly. "We're about to land, but it's going to be in the UN compound."

Jelk advanced, sputtering curses. "Listen, Ricardi—" he began. "I *demand*—"

"You'll demand nothing. If you don't want to walk off the ship there, you can be chucked off in stasis—" His stun-gun was ready. "And don't try anything. Jim Petulengro's right back of you with another just like this one."

Jelk left, and Björn watched him go, thinking how nice it was that looks couldn't kill. Then he followed him

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down to the exit lock. The synthesizer was already there; so were four suitcases, Borrianu guarding them, Jelk glowering over him. Alicia and Hi McCurdey were seated in chairs watching them, each with a stun-gun. Lee Twopersons, armed much more lethally, loomed in the background, ready to kill Borrianu instantly at the first sign of a betrayal.

"You have the routine down?" Björn asked.

"You bet," replied Petulengro. "The moment the port's opened and the plank out, we chuck their junk out, and the instant they hit ground we get the plank back in and seal down."

"Good man. I'll watch from the tower."

As he came back into the control tower, *Lyra* was hovering directly over the compound. He brought her down, wasting not a second. There was the jar of full gravity. The light of Lassa's sun beat down on her. She was completely visible in normal space—and even before the gangplank was extruded they could see signs of alarm and activity. People were calling back and forth, running from buildings.

Swiftly, efficiently, Petulengro and Salazár carried out the luggage, dropped it, stepped aside for Jelk and Borrianu, following with the synthesizer.

Björn saw Petulengro, stun-gun again in hand, order Jelk to keep moving; he saw him and Salazár dash back. Lights on *Lyra's* panels told him the plank was in, the port sealed tight. People, some of them armed, were half-way to the ship.

Praying that at the critical last moment nothing had gone wrong, Björn shifted into Gilpin's Space.

From the tower, he saw the Gilpin-ghosts of Jelk and Borrianu advance to meet the approaching figures, Jelk leading, Borrianu's much smaller figure following him. Then, for an instant, Borrianu seemed to glance back over his shoulder, raising a hand, *waving at them?*

Yes, he had waved at them, and faintly Björn saw that his hand was not empty. It held the laser pistol Becky had given him at the last moment, and a second later its ghost-beam struck the back of Jelk's head, destroying it.

Jelk stopped, stood frozen, then dropped like a butchered steer.

Borrianu turned again. He played the laser beam across the synthesizer, into what might have remained of its banks.

Finally, that done, he knelt, bowed his head, put the muzzle of the pistol in his mouth, and shot himself.

Knowing that Becky would join him in a moment, Björn activated the drive.

Lyra landed at Freyberg Harbor's civilian spaceport in mid-morning, and Björn called Pardee from orbit.

"All safe and sound?" Pardee asked. "How about Becky?"

"She's fine, and everybody's safe except Jelk and Borrianu. Jelk demanded to be dropped off on Lassa, and Borrianu killed him there and committed suicide."

Pardee whistled. "We'll have to expect after-shocks."

"It could've been worse," Björn said. "I let them out in the UN compound. I hope only neutral personnel were present."

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"That could be good or bad—let's hope it's good. Björn, give us an hour or two. I'll get Morrison Whitworth here from Singapore. It's only a few minutes Gilpin jump. He can whisk Becky back with him immediately. That'll spare her when the media zero in on you. You don't mind taking the brunt, do you?"

"Of course not. She's had a rough enough time already."

"Fine. Get back to me—oh, in an hour and a bit more, and I'll have you cleared for landing."

Björn explained to Becky. "It's for the best," he told her. "Otherwise they'll nuisance the hell out of you. This way, by the time your uncle brings you back, they'll probably have some new sensation to take their minds off things."

She frowned. "Björn, that isn't fair to you." She let her hand rest lightly on his arm. "Have you any idea of the debt I owe you? That night, if you hadn't been so kind and patient and—well, I probably would've gone crawling back to Anders, and I hate to think of what might have happened then. At best, he would have made me into a second Borrianu."

A small voice in Björn's mind whispered, a little bitterly, *Is that all she feels for me? Just gratitude?*

But he said softly, "Thank you, Becky. The media can really get their hooks into you, but there's no way they can do anything but bother me." And to himself he added, *I hope.*

When *Lyra* landed, Pardee and Morrison Whitworth were there waiting, and Björn gave them a brief and businesslike report, concealing nothing but the event for which Becky had expressed her gratitude, and who had given Borrianu the pistol.

Finally Pardee said, "It sounds incredible, and God only knows whether he could've brought it off, but even if he couldn't the Man Triumphant people, believing him, would have caused endless trouble."

Whitworth looked at his niece. "Becky, you really are a very fortunate woman." He stood. "You can tell me about it in Singapore. And we'd best get started. Unless I miss my guess, by this time a UN courier ship should've arrived with all the awful details—true and false." He shook Björn's hand. "Captain, you've done wonders—I can tell by the way Becky looks at you. Take care of *Lyra* for us, won't you?"

"Yes—" Becky smiled suddenly. "—of *Lyra* and my harp."

Minutes later, they were gone; and Björn spent the next two hours with Pardee, making what plans they could for the eventual arrival of the media people. Between them, they decided to say nothing of what Jelk had planned, but instead simply to blame events on what the Far Reaches had done to him and Borrianu. They briefed the crew, and were rewarded with a unanimous promise to say nothing about Jelk's new music.

"Luckily," said Pardee, "it simply isn't true that an entire group of people can't keep a secret. History is full of secrets that thousands kept—radar, the proximity fuse, Operation Sea Lion—to mention only a few from the Second War."

Lee Twopersons looked at him. "My wife, who understands these things, believes Jelk was unique—that his com-

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bination of musical genius and delight in suffering won't occur again, but we all agree that not even rumors should get out—simply to keep psychos from trying it. Most of us are still sane enough not to start out a-conquering before we even know what we'd be up against."

Björn and Pardee lunched at the Club, and it was there that news of the courier ship's arrival reached them. "You'd best get back aboard, Björn," Pardee told him, "and I'd better make myself scarce. It wouldn't do for the Legion to get involved. If anything confidential reaches me, I'll see you get it."

Back in the wardroom, his crew around him, Björn had *Lyra* tune in a United Nations news satellite. The impact of Jelk's murder had been tremendous—there was *no* other news. The courier ship had brought witnesses, most of them neutrals, whose stories were surprisingly consistent, and on Borrianu's body a letter had been found, addressed to the Interpol officer attached to the UN mission, who fortunately was a Dane, as was its finder.

It was an astounding document. Borrianu told of his long association with Jelk and Man Triumphant, of crimes committed to their order, with names, dates, places. He told of how Jelk had mistreated Rebecca Whitworth and tortured him. He did not mention how Jelk had threatened to give mankind its taste of blood. Instead, he stated that the voices had turned Jelk into a vampire, one whose appetite for suffering was insatiable, and he described the very different changes those voices had worked in him. The two Danes carefully said nothing about the letter until Lassa had been safely left behind.

Within the hour, *Lyra* was besieged by media men and women, their approach depending on who owned them, those from the super-powers—from behind the Iron Curtain especially—doing their best to trap Björn and his crew into slips and indiscretions, most of the others clearly anti-Man Triumphant and unsympathetic to Jelk.

Within two hours of the first broadcast, Pardee had sent Björn a full transcript of Borrianu's document, from which the UN had deleted certain details of crimes committed—without explaining why. It simply confirmed his decision to say as little as possible to anyone.

The siege kept up for the better part of a week. Then it became obvious that the various authorities involved—the UN, the national governments, even Man Triumphant—had decided to sweep the whole business under the rug. The media took the hint, and went snuffling off on other scents. *Lyra's* people started to relax.

Björn scarcely realized what had occurred until Pardee phoned him. "You won't need to worry about my being seen with you now," Pardee said. "The worst of the hubbub's over, at least for now, and everyone here knows we're old friends."

At the Club, Pardee filled him in on developments behind the scenes. "Things are ironing out nicely," he summed up. "I doubt you'll even need those interesting recordings you had *Lyra* make. Borrianu's confession, and the follow-up Interpol reports, really did the trick."

Finally, dinner over, he sat back with

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his liqueur, and said, "And now, Björn, something more important—what about you and Becky?"

"What do you mean?"

"My friend, Becky's no longer someone else's woman."

It took a long time for Björn to answer. Then, speaking very slowly, he said, "Burton, Becky is famous, world famous. I am not. Becky's rich, and even if I get there some day—and we Far Outers do, as you know—I'm not there yet. Becky's creative, talented, and I—well—"

"I don't think you do yourself justice."

"Anyhow, I *am* a Far Outer, and I guess I always will be. I just wasn't born to be an aardvark. Becky's milieu is here on Earth."

Pardee shook his head. "Nothing you've brought up so far is important, not if deep down the real thing is there. Becky's coming back tomorrow. Tomorrow we're to have dinner with her and her uncle. He's really planning festivities, and there's a great deal they have to tell us, so Morrison has asked us both to check into their hotel so we won't have to shuttle back and forth. There is a man who thinks very highly of you, Björn."

"Becky loved Anders Jelk," Björn said. "She was in love with him. How can she know her own mind now?"

Again Pardee shook his head. "Björn, she did *not* love Jelk. She was *not* in love with him. She loved his music, his genius, if you will. She was torn between that and her instinctive detestation of the man himself. That was why she wanted so desperately to change him."

"I'd like to believe it," Björn said.

"Try. Try hard, I've already made reservations for you. You can move in tonight. Oh yes—when you get back to the ship have Becky's harp sent on ahead. She'll be in Room 511."

Next morning, when he awakened in his hotel room after a night when sleep alternated with waking periods of self-doubt, he learned that Becky and her uncle had already arrived. His bedside phone woke him. It was Morrison Whitworth—Pardee was expected any moment, so hurry down to breakfast.

He shaved and showered and dressed as fast as only a ship's captain can, and found them all at the table. Both Whitworth and Rebecca were delighted to be back, and he was relieved to see that she showed little of the wear and tear of her ordeal.

The talk was light, mostly of what she and her uncle had done in Singapore, the tricks his Chinese shipyard managers had used to throw the media off her trail, people she had met. Then, after breakfast, they spent the balance of the morning with *Lyra*'s crew, still aboard but all now planning what to do on Earth. At midday, luncheon was hosted by Freyberg Harbor's commandant, a Frenchman with a charming wife and an outrageous fund of stories.

So the day passed, and it was only toward the end of supper that Becky finally brought up the subject of her plans. Suddenly very serious, she said, "You know, I always thought of myself solely as an interpretive musician —never, even in my wildest dreams, as a composer. But I've learned something out of all this. Anders planned to exploit

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those poor, suffering, hating, yearning beings whose voices torment us in the Far Reaches. He planned to do it for a purpose wholly evil. But what if someone were to listen to them and then compose a music of empathy, of sorrow, of compassion? Might that not help mankind to understand this Universe we—and they—live in together? I'm sure it would. Björn, do you remember that lovely thing of Takeo Yoshida's, that *Lament* for *Dan-n-Ura*, the one Anders ripped to shreds? Suppose someone could write music like that about those wretched beings?''

Looking at her, at the sudden light in her eyes, Björn instantly was sure she could do it, that she could cross the Far Reaches for a purpose which—whether or not it was successful—at least did credit to humanity.

''Are you going to try?'' he asked.

''Björn, of course I am.''

It was late when they said goodnight. Björn rode the elevator with her to the fifth floor, where she turned left, he to the right.

In his room, he undressed and showered. He stretched out on the bed, and for an hour or more allowed conflicting thoughts to wrestle one another in his mind, everything which seemed so sure to keep the two of them apart.

At eleven o'clock, abruptly, he sat up. ''Hell!'' he said aloud. ''*I'm* not Kormák!''

He threw on a dressing gown, put his slippers on. Locking his door behind him, he walked down the corridor to 511.

He knocked gently.

''Who is it?'' came her voice.

''It's me. It's Björn.''

She did not answer. For a moment, an endless moment, he waited.

Suddenly, then, her harp sang to him, one splendid burst of music, a rising cascade of exaltation, of release, of pure joy.

And her voice reached him. ''Oh, Björn, Björn! Come in!'' she cried. ''*Come in!*'' ■

●Close-up pictures of the moon's surface cause one to doubt if distance ever lent so much enchantment to anything else as to the moon.

Olin Miller

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on gaming

Matthew J. Costello

It was the classic film *2001: A Space Odyssey* that let everyone see what sf writers had known for a long time.

Namely, that space travel would be damned tedious.

While most of the scientists on board the *Discovery* pass the time traveling to Jupiter in a restful cyrogenic deep freeze, the two astronauts are forced to occupy themselves with activities like jogging and playing computer games.

With Kubrick's *Odyssey* we saw, temporarily, the serious, silent side of space travel (before George Lucas launched a space opera revival with the roaring engines and the twelve-o'clock high stunts of *Star Wars.)*

My bias, in space computer games, has, in general, been toward the more fantastic. There are some excellent space station and shuttle simulations available, especially *Space M*A*X* (Final Frontier Software, 18307 Burbank Blvd., Suite 108, Tarzana, CA 91356), a remarkably detailed reenactment of the process of launching and building a space station, and, on a lesser scale of complexity, *Space Station* (Advantage, 20813 Stevens Creek Blvd., Cupertino, CA 95014).

If you want a taste of reality, both of these games will test your mettle. But for the fantasy of space travel we have to look elsewhere.

Starflight (Electronic Arts, 1820 Gateway drive, San Mateo, CA 94404) is an attempt to provide both the wonder, and the realism, of a journey to the stars. The designers wanted to create the experience of exploring the universe. There would be planets to explore with a dizzying array of ecosystems,environmental conditions, and aliens.

Profiles and histories were created for the alien races, each with a highly specific language, behavior, and reaction to the explorers from Earth. A special communication module was created to talk with each species.

The astounding thing about *Starflight* is that the game reaches its goal without becoming weighted down with a lot of tedious, essential gameplay. Real decisions need to be made, but they never get in the way of the fun.

Play begins at a starport, a base that allows you to organize and train a crew, load material to trade, configure your ship to your specifications, and read interesting messages from other starports and adventurers. In a surprisingly quick time, you can have your ship armed, shielded and staffed by a crew.

Though easily done, decisions made at the starport (as your captain strolls around) are crucial to later success. Too many missiles and not enough fuel can leave you stranded in space, issuing a frantic SOS.

The alien races in the game are described in a helpful manual which lets you compare their skills with yours. Knowing the characteristic of each race

(continued on page 186)

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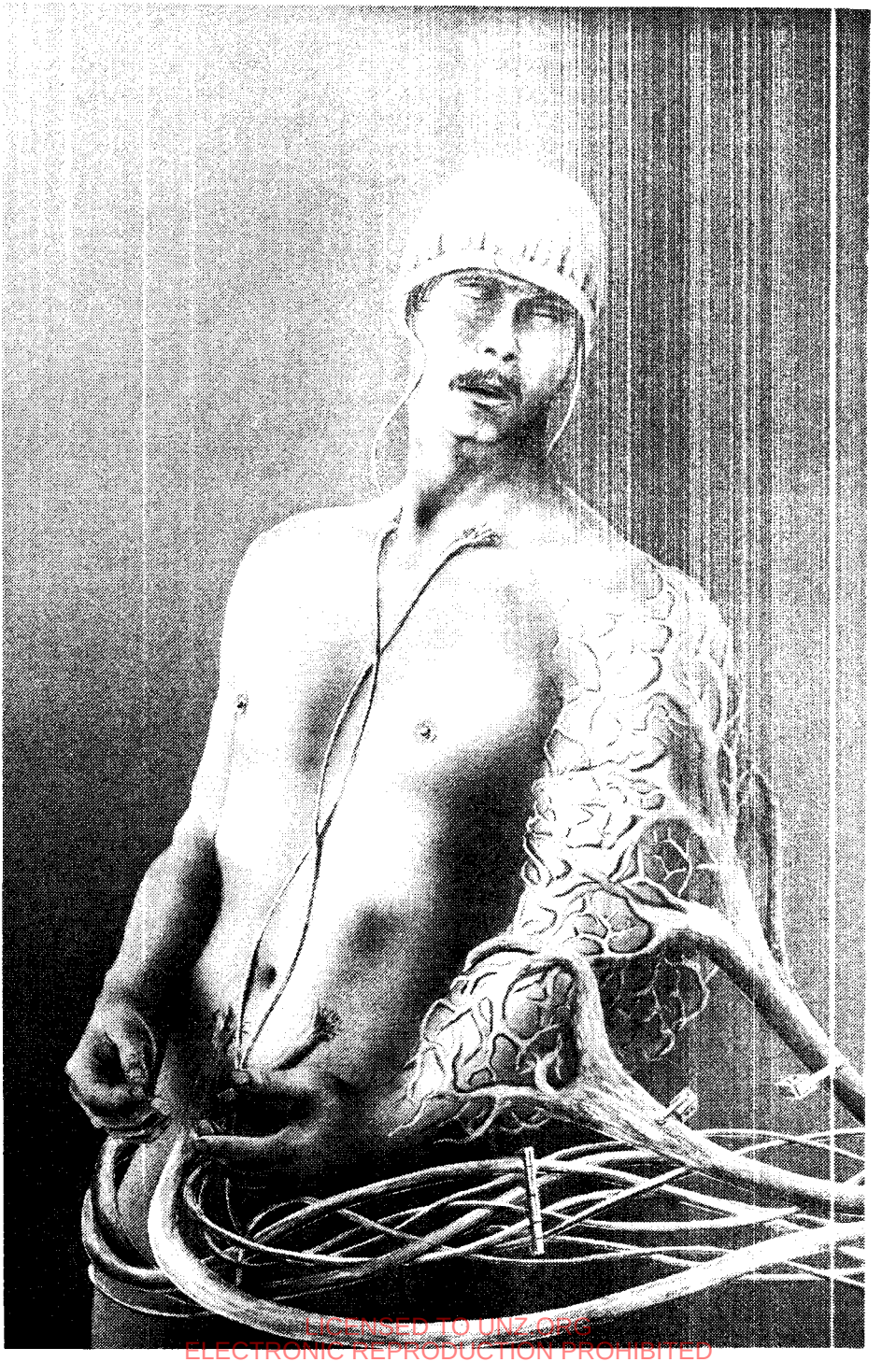

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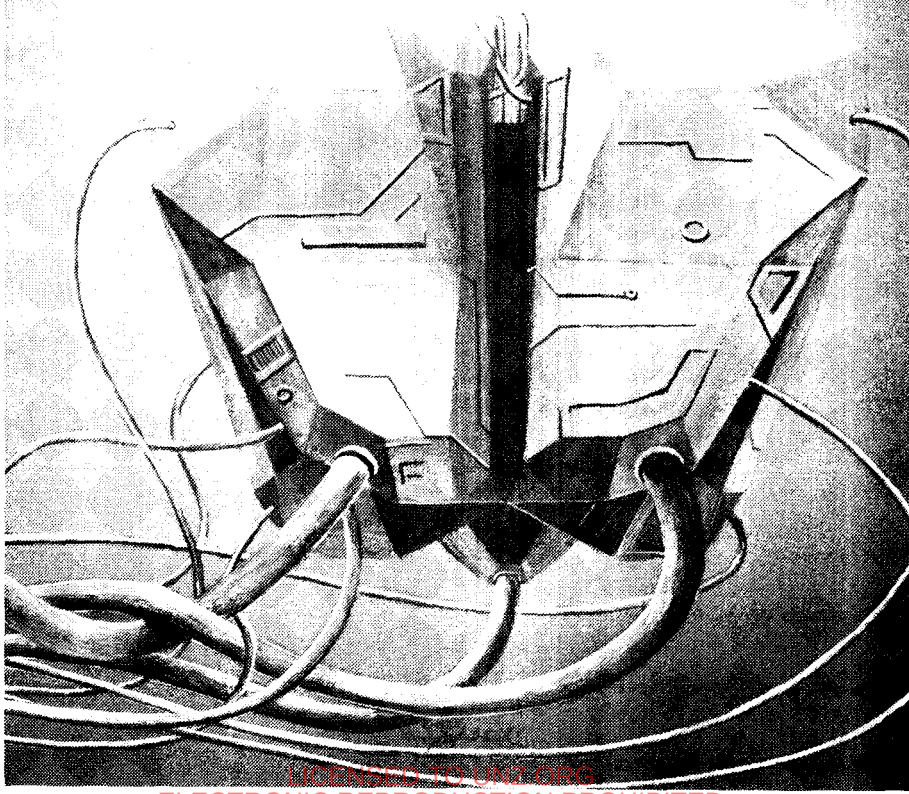
24TH CENTURY MEDICINE

Thomas Donaldson



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"You were only ten years old, running and jumping, full of ballgames and Masters of the Universe, when they told you that you had osteogenic sarcoma. You cried and begged your mother not to let them cut off your leg. Five interns had to hold you down when you tried to run away. When you woke up, your right leg was cut away at the knee."

We don't like to think about our own vulnerability. Every day, accidents and diseases severely injure people just like us. They happen quite unexpectedly, one day everything seems to be going well and the next day, we face utter terror. And this is not a terror of Arcturian invasions, but an ordinary terror, happening to our next door neighbor or ourselves.

This article is about medicine in the twenty-fourth century. But we need to stand back from that first, for perspective.

In the seventeenth century more than 50% of all children born never lived past age ten. Nineteenth century writers like Dickens wrote death scenes, children dying of cholera, or whooping cough, or diptheria, or scarlet fever. . . . People died at all ages. Smallpox scarred others for life. Nobody liked this fact, but it was so common that everybody lived their lives without ever thinking about it, unless it suddenly became real, for themselves, or their children. And if so, nobody else paid attention. The invisible terror remained invisible to them, and so thankfully, they went about their own affairs.

These diseases were an unseen background to life. Wealthy families would leave town every year in the cholera season. City fathers would shut up houses on quarantine. People would not often talk about their vulnerability any more than they now talk about the color of the sky.

But the other side of vulnerability is heroism. If no injury was final and we could put everything back as good as new, heroes become impossible. Invulnerable people can't even fall in love. Nobody writes stories about them. They have no *problem*. We are even now invulnerable to diseases which once brought terror to whole cities.

To understand medicine of the twenty-fourth century we have to understand the thin line between vulnerability and invulnerability. This line dominates our lives night and day. It is so important that we learn to walk along it without ever thinking about it, any more than we think about breathing. We construct our happiness or despair on that line.

The most important point about twenty-fourth century medicine is this: that line will be ELSEWHERE.

For science fiction writers, vulnerability and invulnerability are also essential. If unshielded high dose radiation is no longer dangerous, that's bound to affect the *story*. If bad guys once "killed" can come back, or people can recover from gaping stab wounds to the head, the entire meaning of a fight is transformed. Amazingly, events in many science fiction stories depend on injuries or diseases likely to be trivial problems a few centuries from now. Who would write a story today, about a little girl's

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death from scarlet fever? Nobody dies of scarlet fever any more.

WHAT IS HUMAN?

Of course we might totally redesign ourselves. But some human traits are so fundamental to almost everyone's concept of who they are that they will actively resist any redesign, for themselves or for their children. In some fundamental ways people will *not* change. In other ways they may change profoundly: but the points on which they stay the same are just as important. In Box 1, I list some *essential human traits* and others where redesign might happen.

We can imagine ways to turn people into docile slaves, to rework them as parts of spaceships, or turn them into six legged creatures living on the floor of ammonia seas. But this article isn't about what can be done to one group of people by another. That is assault rather than medicine.

We do not want anything done to us which will make us something else entirely, that will make us say: that is not me. But who are you? Here is a test for biological changes to human beings: if

BOX 1: CONSTANCY AND CHANGE

Biological control implies the ability to change human design. Here are some things about ourselves we will want to keep, and others we will change.

CONSTANTS:

* *External anatomy*. Our current body form and size remains important in relating to other human beings (an "attractive" man or woman). We use tools, detachable parts, to overcome defects in our anatomy.
* *Facial expressions*. We communicate with our faces.
* *Individuality*. People resist becoming hive creatures or total separation from others. Finding a balance will still give us problems.
* *Sexuality*. Sex will still give us problems. Couples will still pair and have children.

CHANGES:

* *Biochemistry and metabolism*. We may use new enzymes and cell constituents containing metals (gold, arsenic) and other rare chemicals.
* *Internal anatomy*. New internal organs for life in space, defense against biological invasion, renewal of worn out parts.
* *Immortality*. Redesign so that aging does not happen.
* *Sleep*. Brain and body reorganization so that sleep is unnecessary. We will become tired far less easily. We'll have more energy and not *want* to sleep.
* *Brain*. Improved sensory discriminations, broader and longer attention span. We don't currently know how our brains work. Potential improvements are hard to see, but must certainly exist.
* *Sexuality*. Pregnancy may shorten or disappear entirely. Cloning may become important, but people will see clones as continuations, not as new people ("He lost all his memories and had to relearn everything").

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people can be found who genuinely want such a change for themselves, then it will happen, and in some sense is a subject about medicine. All other events constitute assaults. Assaults will happen, but they are the *problems* of medicine rather than its success.

What is most important about identity is that our bodies and our senses are not external tools. We *are* our bodies. We cannot put them on or take them off like clothing. Our nervous systems map our own particular body. We can't just put new eyes on like binoculars. If we had the eyes of eagles we'd need the brains of eagles to use them and the *feelings* of eagles to respond to what we see. These feelings, the neurology underlying our senses and our body, are far more important to our sense of self than just a piece of anatomical equipment.

Medicine is a branch of technology, but not just a branch of technology. We must trust our doctors. They reach into parts of ourselves very important to us. Anyone who changes our body is also changing our soul. Some of the transformations I discuss in this article may not seem to deal with medicine at all. But all of them involve changes which are terribly important to us. We could not allow these things to happen lightly, or to be done by a random stranger. One way medicine differs from other fields is that it invades the soul.

And so we see one kind of twenty-fourth century terror: that you are one day kidnapped and integrated into a spaceship. And from this assault you will need healing, to return you to a human state. They may have to force you not to be a spaceship. Not only is your body injured, but also your soul. We will have to discuss how that healing could come about.

CAPABILITIES

We can best judge capabilities of twenty-fourth century medicine by looking at what living things can do now. If today's animals or plants can do something, then some way exists to do it completely under human control. We will make quasi-living creatures, not just of the size and complexity of viruses, but up to and including the size and complexity of redwood trees or whales.

Learning to manipulate living creatures is exactly like learning to use alien machines whose vanished owners built them for unknown purposes, and with locks to prevent unauthorized use. Living creatures are independent of our wishes. Their entire design aims toward their own perpetuation and defense. We can't transplant organs because of immune systems. We can't mold them like clay because they try to retain their own forms. The creatures we build will have no such independence. They needn't even have drives to find their own food.

To some unknown degree, we will also make creatures with biochemistries quite unlike any which have yet developed in nature, or that ever could develop in nature. For all current Earth life, water is the major solvent and transport chemical. But ammonia supports biochemical reactions. Silicone fluids which freeze at $-100°C$, forms of oil with higher boiling points than

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water; all these might support enzyme chemistries very broadly similar to our own. Oceans of silicone fluid just won't happen naturally. But they need not happen naturally for us to make biochemistries based on them.

The simplest forms of such machines would be single cells, like macrophages. Macrophages are part of our normal defense mechanism. These cells move about inside our tissues, destroying old and foreign cells and other debris. They slip between existing cells, accessing every part of our body. Cell membranes aren't solid walls. Artificial macrophages could pass through (not between) existing cells, reaching any body tissues. They could deliver genes or chemicals, take control of their target cells' metabolism, or even replace target cells entirely by budding off a new copy. Normal macrophages use the bloodstream for transport. Artificial macrophages could use the bloodstream too.

Artificial macrophages can also communicate with one another. They can release diffusible chemicals to guide one another's behavior. Based on what one set found in the retina, for instance, others could carry out special modifications in the visual cortex. These devices can form an integrated repair system much larger than a single macrophage.

Some repairs need delivery of materials to a repair site much faster than the vascular system provides. We'll need devices to grow their own support tissues into a patient. For instance, severe crushing or mangling injuries require us to provide a new vascular system. The repair device might resemble a fungus, growing mycelia into the injured tissue. The mycelia would grow between existing cells rather than destroying any. We can call such devices *repair nets*. A repair net can work together with a whole family of macrophages. For instance, the macrophages could reach their target through the mycelia of the net.

Many of our organs have few provisions for self-repair. That must be done externally. If our heart is injured, we lack a backup heart. Furthermore, some modifications and transformations require external support simply because our bodies have no way to bring enough materials and energy to the repair site. The final level of repair machine actually takes over metabolism of a patient from the outside.

We can therefore expect devices which would enfold a patient completely and carry out repair. We have a model for such devices already, the womb. It supports the infant by external supply of blood and oxygen and external removal of wastes. But such a device would have even greater powers to control growth and development of the patient inside it. It would take over from the patient's own genes, controlling growth according to its own program. It would have a *brain*, to manage its control and maintain homeostasis. It could take apart a patient's entire body cell by cell, rework it into something new, and return the cells to their original location. I will call such a device a *chrysalis*.

Chrysalises, repair nets, and macro-

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phages are *types* of machines. They would have many specialized forms for different jobs. They would have programmability. Some would be adapted to replacing only particular organs. Some repair nets could force rapid wound repair. A broken bone, for instance, would be set inside a repair net bandage. This would grow into the tissue, controlling and promoting repair. Others would be adapted to reworking and repairing nervous tissue. Some chrysalises would specialize in reviving "dead" tissue, such as severed limbs. These would be reattached after revival by another chrysalis.

The ability to design whole animals and plants to specification also means complete control over existing creatures, their metabolism, growth, and development. Since cancer is a disease of growth and development, we can expect that cancer would be a long-vanished problem. But this includes not just cancer, but also wound healing, loss of limbs and organs, and aging.

Growth and development are now almost completely out of our control. Whenever we now want to alter the shape of bone or tissue we use surgery. But all surgery is only a crude makeshift. A medicine based on control of growth and development would treat problems very differently. We would alter shape of bone or tissue by a kind of directed growth. Millions of macrophages would enter the patient, controlling growth or breakdown of our tissues. Similar methods could modify individual cells. A genetic modifier would be a macrophage-like cell. Millions of these would enter a patient, where they would search out target cells and individually change, remove, or modify their genes.

FIRST AID

What medical problems do we have now that we'll still have in the twenty-fourth century? The major problem will have to be physical injury: broken bones, damage to internal organs or the brain, people sliced open by machinery, knifings, gunshot wounds. Machinery will still malfunction. People will be hurt, often far from places where full scale medical help is available.

Ideally a first aid kit is something everyone can carry with them in their wallet. What problems could a first aid kit deal with? How would it work?

The first aid kit might consist of machines the size of an aspirin tablet. They would get some or all of their materials and energy from the patient's own tissues. People going into dangerous situations might build up their resistance by vaccines of the kind I'll describe in the next section.

The intelligent glue. This is a tablet of small single-celled machines. To use, you stick it to the skin near the injury. The devices soak through the skin, seeking out areas of broken bone and skin. Once there, they transform into the required cells for repair. If they settled around the region of a broken bone, for instance, they would form a glue to hold together the broken bone and chondrocytes to make new bone.

The intelligent bandage. Repairing more extensive wounds or injuries needs

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BOX 2:

WHERE ARE WE NOW: MACROPHAGES

By now (1988) virologists routinely create modified viruses to place specified genes into the DNA of target cells.

Attempts to cure one disease, Lesch-Nyhan disease, are imminent. Lesch-Nyhan disease, which causes mental deficiency and uncontrollable self-mutilation, results from a single missing gene. Because Lesch-Nyhan disease is so simple, primitive genetic surgery will work. Full genetic surgery needs much more capability. Sometimes host cells turn off inserted genes. Again, transfer viruses can put genes into the wrong cells, where they cause new kinds of pathology.

The problem is that most genes require regulation by others. A.D. Miller and others at the Salk Institute have created a virus carrying not just a gene, but its regulator genes, into host cells (A.D. Miller et al. SCIENCE 225 (1984) 933-8).

To keep transfer viruses from reproducing, we create modified viruses lacking genes for chemicals essential to reproduction. We grow many transfer viruses with a second virus (called the *helper virus*). The helper makes the essential chemicals. After separation from helpers, these viruses can insert their cargo of genes into cells, but not grow in them.

The macrophages I discuss are much more elaborate. They can carry much more control machinery to recognize target cells, responding only to them, or responding differently depending on cell type or cell conditions. They can still work even if the target cell isn't functioning (viruses can't do this). They can rebuild target cell machinery other than the genes. They can also transfer many more genes, up to an entire copy of the patient's genome.

R.D. Cone, R.C. Mulligan "High Efficiency Gene Transfer into Mammalian Cells: Generation of Helper Free Recombinant Retrovirus with Broad Mammalian Host Range" PROC NATL ACAD SCI 81 (20) (1984) 6349-53.

M.A. Eglitis, P. Kantoff, E. Gilboa, W.F. Anderson "Gene Expression in Mice after High Efficiency Retroviral Mediated Gene Transfer" SCIENCE 230 (1985) 1395-8.

A.D. Miller, M.G. Rosenfeld, et al. "Infectious and Selectable Retrovirus Containing an Inducible Rat Growth Hormone Minigene" SCIENCE 225 (1984) 933-8).

a *net*. The intelligent bandage sends mycelia into the patient and grows up a support network on which repair can commence. You attach it to the patient, just like the intelligent glue.

Diagnosis and control. A lot of contemporary medicine involves recognizing what is wrong with a patient. The attention of the doctor takes over the normal function of monitoring and control performed by our own body.

First aid devices will have brains and sensors. Just like our own bodies, they will respond to low calcium in the bloodstream by releasing more. A small package attached to the neck can take

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over from our normal glands. It can prevent patients from going into shock, for instance.

The intelligent IV. Often doctors must deliver drugs or blood plasma to their patient's bloodstream. This requires placing a needle into the patient's vein, a skilled task. The intelligent IV will have teeth and tongue like an animal's. It seeks out and connects to veins or arteries. It becomes a part of the patient's body. No skill is needed.

These devices can carry their own intravenous fluids, drugs, and microscopic repair machines with them. Attach them to a patient, and they will work out what is needed and inject it into the bloodstream.

The stasis machine. Sometimes injuries are too serious to leave a patient awake. This device puts the patient in hibernation. It sends out macrophages to modify and protect critical tissues like the brain. The macrophages redesign these tissues so that they withstand prolonged periods without glucose or oxygen. (As if their cells turn into spores). It then shuts down the patient.

THE HOSPITAL

Medicine based on growth and development will make almost no use of surgery. Many problems requiring surgery, like cancer or heart disease, simply will not occur. Yet surgery is the most important function of hospitals today. Even without surgery, though, less portable or less common equipment will belong in hospitals. Patients will have devices growing into them or enveloping them, sometimes much bigger than they are. Here is some equipment that will probably be available.

Diagnostic machines. This consists simply of a fine dust of macrophage spores. Patients inhale it. The machines would enter the body, explore all through it, and return through the exhaled air. Another machine catches exhaled air and reads the problem from the diagnosis machines.

The net as substitute for the cast. Accidents causing major internal injuries need more than first aid. For instance, heart and lungs might become crushed and nonfunctional. We put the patient into stasis. Repair nets for such injuries would grow into a patient, reverse the stasis in their cells, and start regrowth. They provide their own substitute heart, lungs, and blood vessels and their own autonomic nervous system to keep track of their patient.

We could treat crushed limbs the same way. The same kind of morphogens causing our limbs to grow properly in the first place can shape them for repair. A repair net would grow into the limb, guided by recognition of the injured cells and a plan for how the limb should look after repair.

Hospitals involve much more than

BOX 3:

WHERE ARE WE NOW: DEVELOPMENT

As far back as the 1930s, scientists developed indirect evidence for *morphogens*. These diffused through the body of a growing animal, and their concentration at

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particular locations told cells there what to do. One known morphogen is a derivative of Vitamin A, *all-trans-retinoic acid*. It controls growth of chicken limbs. Morphogens for slime molds and hydra are known (C. Thaller, G. Eichele NATURE 327 (1987) 625-628).

One class of DNA sequences, the *homeo box*, characterizes genes controlling development in fruit flies, flour beetles, mice, and man. Specific homeo box genes are active only in specific segments of mice and fruit flies. Mark Krasnow and others at Stanford have traced interactions between homeo box genes (one gene turns on or off another) in fruit flies (M.Robertson NATURE 327 (1987) 556-557).

Morphogens allow very fine guidance of repair and removal of misplaced tissues by artificial macrophages or nets. These devices could also recognize cell types and even to which segment a cell belonged. They could turn on growth and division genes in cells where these are normally off, and guide the resulting growth.

Sheard, P.; Johnson, M SCIENCE 236 (1987) 851

Utset, M.F.; Awgulewitch et al. SCIENCE 235 (1987) 1379-1382

* *Reviving brains after oxygen and blood flow have ceased.*

Commonly, if you aren't drugged or cooled down, after five to eight minutes without blood flow, current medicine can't revive you. *But* this isn't the whole story. Over the last 20 years, a quiet revolution has taken place. Reviving brains injured by prolonged lack of blood flow has become a major research problem.

In 1969, K.A. Hossmann and S. Sato revived electrical activity in cats' brains left without blood for an hour. Several drugs improve recovery, including naloxone, verapamil, nicardipine, gangliosides, taurine, and others.

Unfortunately, since Hossmann and Sato, clinical treatments for brain damage haven't yet materialized. The problem turns out to be more complex than neurologists hoped. Even partial success, however, means a great advance in treating strokes and brain injury.

Neurons don't disappear when deprived of blood flow. They gradually decline over four days. Protein synthesis fails in these injured neurons, and they become hyperexcitable. These two events eventually kill them.

Since brain damage matures over days rather than instantly, macrophages can take control of injured neurons, provide any protein synthesis ability they lack, and guide them back to health. Treated brains would look inflamed. Other macrophages may weaken skull bones to allow swelling.

Most citations here are for recent work on the subject:

Baskin, D. et al. NATURE 312 (1984) 551

Drejer, J. et al. JOURNAL OF NEUROCHEM 45 (1985) 145-151

Karpiak, S.T. et al. STROKE 18 (1987) 184-187

Hossmann, K.A.; Sato, S. SCIENCE 168 (1987) 375

Suzuki, R. et al. ACTA NEUROPATH 60 (1985) 217

Thilmann, R.; Kiessling, M. ACTA NEUROPATHOLOGICA 71 (1986) 88-93

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this. Right now, we take someone to the hospital for serious conditions. Someday our serious medical problems will be trivial. Serious problems for twenty-fourth century medicine will be utterly impossible.

BEYOND THE BOUNDARIES OF THE POSSIBLE

Medicine doesn't just consist of cures for known diseases which everyone believes are someday curable. It consists of cures and treatments for conditions now so far beyond treatment that they don't even have a name or seem to be diseases. Now, in 1988, we call all such conditions by only one name, "death." But "death" conceals a multitude of "diseases" each one of which must have its own individual cure. It falls apart into a million different conditions, some of which they will know how to treat, others not, and others which will be subjects of intensive research. For twenty-fourth century medicine isn't the same as twenty-sixth century medicine. . . .

The chrysalis for cellular repair. Poisoning, asphyxiation, drowning, all require cell-by-cell repair, perhaps too extensive for macrophages. A chrysalis first envelops the patients, then enters in between all his cells. It disassembles the patient, surrounding each cell with its own repair machinery and vascular system. The geometry already preserves information about locations of the patient's cells. If necessary, though, morphogen chemical gradients could also retain this information. A patient would swell up to 10 times original diameter. After repair, the chrysalis withdraws the same way it entered.

Since our brains contain our selves, chrysalises might work only on the brain, regrowing the rest of the body.

Chrysalises couldn't restore lost information. But information very likely survives for much longer than we can now restore life. Intensive research goes on now to revive brains deprived of oxygen for up to 60 minutes, with tantalizing successes. Beyond about an hour without O_2, metabolism of brain cells becomes a great mystery. We know that extensive structure remains on a light-microscopic scale. On electron-microscope scales, cell structures are quite disrupted. We don't know how much structure is critical or how memories are stored and how durable they will be. Our permanent memories may code by changes in activation/deactivation of genes in each neuron. This would mean that personality would survive many hours after cessation of circulation. Anthropologists have recovered fragments of brain DNA from Indians buried 3,000 years ago in a peat bog. So long as fragments of nervous tissue exist, chrysalises could reconstruct a brain around those fragments and a body around the brain.

Many current conditions, including cryonic suspension, are very simple compared to problems for which chrysalises are needed. They probably won't need more than macrophages and nets for repair.

"Death" isn't the only impossible problem. Brain and spinal injury currently devastate their victims. Active

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research goes on to repair these problems, too. For both rats and monkeys, normal adult neurons in their brains will divide. Control of growth and development specifically includes restarting growth in cells which have normally ceased to grow. Macrophages can enter these cells and rework the genetic controls on growth.

Ability to recover people after such serious injuries necessarily means the creation of whole classes of identity-damaged people. These will be people who have lost whole sections out of their previous lives because of some brain injury, now totally repaired. You may have been married to a woman for 40 years, but after injury and repair remember nothing of her. The way we act toward stroke patients tells me that

BOX 4:

WHERE ARE WE NOW: DEATH REVERSAL

Since each form of "death" is a different pathology, I can't discuss all forms briefly. I will discuss two questions:

* *Survival of personality:*

During an initial period after formation, chemical and other treatments can erase memories. Afterwards, however, no known treatment disrupts memories without total destruction of neurons. Permanent memories persist for years. These facts suggest (but don't prove) great durability.

Currently the leading theory proposes that chemical changes in neurons from learning resemble those of cell differentiation. Specific genes are turned on or off when a neuron acquires a memory (cf. F. Goelet, E.R. Kandel et al. NATURE 322 (1986) 419-422). This theory would predict that, like differentiation, memories are very durable.

Two alternatives for memory are now disproven:

Our brains don't need continued electrical activity to remember. Audrey Smith cooled hamsters down to near 0°C, stopping all electrical activity. Afterwards, they remembered mazes they had learned.

The wiring diagram of neurons to one another also doesn't code memories. Since salamanders can repair massive brain injury, Paul Pietsch cut salamander brains into pieces, scrambled the pieces, and reimplanted them. These animals recovered, and also remembered. Furthermore, molluses such as Aplysia can achieve very rudimentary learning. Their nervous systems are small enough that we have mapped them completely. Their connections don't change with learning.

Allport, S. EXPLORERS OF THE BLACK BOX, W.W. Norton, New York 1986
Goelet, P.; Kandel, E.R. et al. NATURE 322 (1986) 419-422
Pietsch, P., SHUFFLEBRAIN, Houghton-Mifflin, Boston 1981
Martinez, J.L.; Kesner, R.P. LEARNING AND MEMORY Academic Press 1986
Smith, A.U., BIOLOGICAL EFFECTS OF FREEZING AND SUPERCOOLING, Williams and Wilkins, Baltimore 1961

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we're certain to treat these people not as new people but as the same people they were before injury. But it will be a new kind of brain injury, one we don't have today because all such patients now die. And it will be a kind of brain injury no amount of biological control can cure.

METAMORPHOSIS

Our most important biological changes will be invisible, changes in metabolism and repair, changes in mental processing. We would use our biological control, metamorphosing into new creatures able to live in new environments. Macrophages could remodel our cells to have these traits, a kind of vaccination.

Radiation resistance. High resistance to radiation needs active repair mechanisms for genetic and biochemical damage, much higher levels of antioxidants, and duplication of genes.

In space we also need resistance to ultraviolet radiation. Ultraviolet causes much the same kind of cell damage as gamma radiation, but to skin surfaces alone. High ultraviolet resistance may involve very high melanin production: a capacity to change skin color to deep black.

Weightlessness. Our balance perception adapts spontaneously. After Skylab, astronauts could happily sit in high speed rotating chairs without becoming dizzy. In weightlessness the major losses are of bone, muscle, and blood cells. We don't know how adaptive these changes are. Perhaps we could last indefinitely in weightlessness after initial adjustment.

But we can change ourselves to adjust quickly between gravity and weightlessness. We might have richer nets of blood vessels to bring supplies for rapid growth into muscles, bone, and marrow. Moving from weightlessness to gravity should increase production of bone, blood cells, and muscle. Reverse movement should cause equally marked loss of tissue, degradation, and storage as fat.

Decompression. The ability to live unprotected in space, even for a short time, may become extremely useful. Whales can store enough oxygen for an hour without breathing, in the myoglobin in their muscle. Short periods in vacuum shouldn't cause an oxygen problem. We would need skin better able to withstand internal pressure, nictitating membranes to protect our eyes, and muscles able to close off our lungs and gut from vacuum. Since whales adapt to equal decompressions, there's no serious design problem.

Cold. Our skin darkens in sunlight. Some people will find it just as useful to grow a thick fat layer in the cold.

Not everyone would metamorphose. Protective clothing is often the best adaptation of all. But even simple adaptations to cold or vacuum become important for workers in hazardous jobs.

Metamorphosis may require such a thorough rebuilding that our metabolism cannot run normally while it goes on. With a chrysalis providing external support, quite profound rearrangements of metabolism become possible. Here's how to redesign someone to live in a

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cryogenic ecology on Titan. (The ecology itself may be man-created. We may create animals and plants able to live on many planets where life could not evolve naturally).

We must rearrange someone's entire biochemistry in every single cell. First, freeze them down to the low temperature to which they are to be adapted. Second, the chrysalis grows in between their cells, much as in cellular repair. Of course it has the proper metabolism to operate at −200°C. The chrysalis then individually rebuilds every cell into cells with cryogenic metabolism. It sequesters the patient's memories and maps them cell by cell onto similar structures in the target organism. The chrysalis then withdraws in reverse order. The metamorphosis is done. The man may awaken as a cryogenic creature.

Of course, metamorphosis needn't rebuild someone's whole body in all cases. For instance, our liver performs critical functions in storing energy (in glycogen) and detoxifying foreign chemicals. We may wish to rework our liver so that it will also store oxygen, as part of adapting someone to live unprotected in space. A net could substitute while rebuilding the liver from without.

IMMORTALITY

Of all suggested modifications to human beings, only one has extremely vocal, serious, and organized proponents right now. That is immortality. Its most organized proponents are the cryonics societies.

Clearly *means* can exist to prevent and reverse aging. And they do raise an issue about identity. Most people think of themselves with finite lifespans. They say: "That will happen after my time," or "I'm glad I won't be alive to see that." They have planned out their whole lives on their mortality. They go to school at a certain age, marry, have children, plan on leaving an estate on their death. Faced with the possibility, they ask if they would be themselves if they were made immortal. There is no easy answer to that question.

We can deal with major deteriorations of aging, including brain and heart breakdowns, by permanent alterations to our ability for self-repair. Modified people could go on indefinitely without growing old. Body structures like teeth, which slowly wear away, could renew themselves by slow growth of new tooth buds. If you live long enough, however, you are certain to suffer a severe accident. That accident will need external repair.

Old age has no positive evolutionary effects. Fundamentally it happens because our former life styles rarely allowed people to live to age seventy. Now, when so many people do, we literally run out of the biological program. The symptoms of this loss of program are exactly those of old age.

Preventing and reversing old age will happen because people who did not age would have an evolutionary superiority to those who did. They would not spend so much energy supporting infants and young children. Nor would they burden their own children with their care in old

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age. Right now, about 50% of the population is dependent through age (too much or too little). Everyone takes this biological burden for granted, just as they once took it for granted that most children would die before age ten.

Of course, immortality rearranges a lot of common science fiction plot situations, too.

DISEASES WE DON'T KNOW WE HAVE

Conditions of life can change so much that traits once useful become actively harmful. It's not easy to predict conditions of life and their problems. To seventeenth century doctors, the concept that obesity could cause problems would seem far away. The problems only appear at ages few seventeenth century people would attain. Even more, obesity was then a *positive* trait, a sign of wealth and beauty. A seventeenth century doctor, once seeing the disadvantages of obesity, might still balk at doing away with this form of beauty.

We may be seeing one "disease" like this now. Getting good jobs in 1987 requires some level of technical skill. This learning takes personal traits (emotional ability to study and listen) and brain processing. Someone without these traits finds academic learning hard: this is *learning disorder*.

BOX 5:

WHERE ARE WE NOW: IMMORTALITY

* *Intervention*. Immortality (absence of aging) is a subproblem of development. Gerontologists have known that low calorie diets with all essential nutrients doubles lifespans since work by Clive McCay in 1934. These diets cause unknown changes in hypothalamic hormones. Serotonin is somehow involved.

The major reason why aging research has not advanced further with this problem is the emotional turmoil felt by funding agencies and scientists themselves at the concept of interfering with aging.

McCay, C.M. et al. JOURNAL OF NUTRITION 18 (1939) 1

Timiras, P.S.; Segall, P. FEDERATION PROCEEDINGS 34 (1975) 83

* *Evolutionary explanation*. Different animals and plants live for different lengths of time. These lifespans need explanation. Why don't people live as long as redwood trees?

Most evolutionary biologists would explain aging as a secondary effect. Animals in nature die of starvation, disease, or predation before they grow old enough to show old age. Their lifespan corresponds to just past the point at which, in nature, almost all are dead anyway. Their bodies have self-repair programs telling what to do up to that age. Our own life conditions are much better than formerly. We almost all live long enough to run out of program. Old age is the symptom of this running out of program.

G.C. Williams "Pleiotropy, Natural Selection, and the Evolution of Senescence" EVOLUTION 11 (1957) 398-411.

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Mental and emotional skills someone would need to do well in twenty-fourth century society won't just be enhancements of current abilities. To do well, we'll have to *lose* some abilities we now have. Someone from the 24th century may well appear *less* intelligent on all our current tests. For instance, current tests require testees to follow orders. With many robots available, following orders could become far less valuable.

The metamorphosis needed, a slightly rearranged brain, is simple. But our whole personality is bound up in our abilities or their lack of abilities. To change these involves many questions biology won't answer. A sufficiently advanced technician might appear indistinguishable from an idiot. Do you want to become an idiot?

ILLNESSES OF THE TWENTY-FOURTH CENTURY

All currently known medical problems will be easy exercises for novice doctors. So what could go wrong? Let's look a little at history.

In the Middle Ages, wolves ranged freely over Europe. They disappeared from England first of all, but even in 1500 wolves remained abundant in France. In the winter time, they came in packs into Paris and ate children, dogs, even adults whom they found alone on the streets. And now, we no longer have problems with wolves eating our children.

But wolves are wild things. So are viruses and bacteria. In 2300 people will no more suffer from predation by wild bacteria than they now suffer predation by wolves. A second class of current diseases are *diseases of development*, like heart disease or cancer, in which normal growth and development become deranged. Fundamentally, they stem from aging, which is the most fundamental process of growth and development. Of course, all such diseases will disappear, together with aging itself.

If human beings take control of life, human beings will cause all medical problems. That is, problems will consist entirely of accidents and assaults.

Of course, crime is another form of predation. Chrysalises, nets, and macrophages could all be turned to criminal use. Specially constructed macrophages could enter our brains, change our memories and desires, and turn us into the slaves of their creator.

Accidents needn't just consist of broken bones. People can be injured by release of biological agents or toxins. Many nineteenth century doctors spent years working out causes for diseases. Even in this century, doctors had to solve Legionnaires' disease and AIDS. Similar detective work will go on. It would involve not just seeking out harmful *chemicals*. We would have to search out harmful nanomachines, creatures able to multiply and grow. But unlike the nineteenth century or the present, such creatures would be entirely man created.

History suggests another change too. European populations so easily overwhelmed the peoples of the Americas because Europeans arrived carrying many deadly diseases. Centuries of plagues

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gave them immunity. The Indians had no such immunity. They died of terrible plagues soon after the Europeans came.

If the major disease problems of the twenty-fourth century consist of accidental or deliberate release of organisms, then we expect that people of that time will carry with them new enhancements of their immune systems. These enhancements, just like the diseases which made them necessary, will be man created. Anyone of the twenty-fourth century will be able to resist bacterial devices which would rapidly kill any unprotected person of our time. If hostile nets can invade our brains to take control, then we'll have equal defenses against them.

Control of living things puts responsibility on us, not on the wolves. We could become very sick in the twenty-fourth century.

Nevertheless, we live at the end of a very long historical trend toward longer lifespans and less sickness, and even less death from other causes. This trend tells us that people of the twenty-fourth century will live much longer lives and expect even longer ones, into millennia. But that is a statement not about medical technology but our own use of it. ■

NOTES AND REFERENCES

The first suggestion of a repair machine was Jerome B. White's (1969), a modified virus. The idea of macrophages and repair nets existed at least since 1977, when Thomas Donaldson wrote a discursive bibliography ("Cryonics: A Brief Scientific Bibliography") describing means of repair, and Michael Darwin independently proposed a modified white blood cell for repair ("The Anabolocyte: a Biological Approach to Repairing Cryoinjury," LIFE EXTENSION MAGAZINE 1977, 80-83). In 1977 Thomas Donaldson also circulated a description of the chrysalis, though not by that name. This was published in THE IMMORTALIST (12 (1981) 5-10) as "How Will They Bring Us Back, 200 Years from Now."

About 1984 or earlier, K. Eric Drexler circulated ideas for cell repair machines, based on a mechanical tradition. These contain important new ideas, particularly calculations on sizes and implementation. Unfortunately his book, ENGINES OF CREATION (1986), lacks a technical appendix describing these.

● Science has made gods of us before we were even worthy of being men.

Jean Rostand

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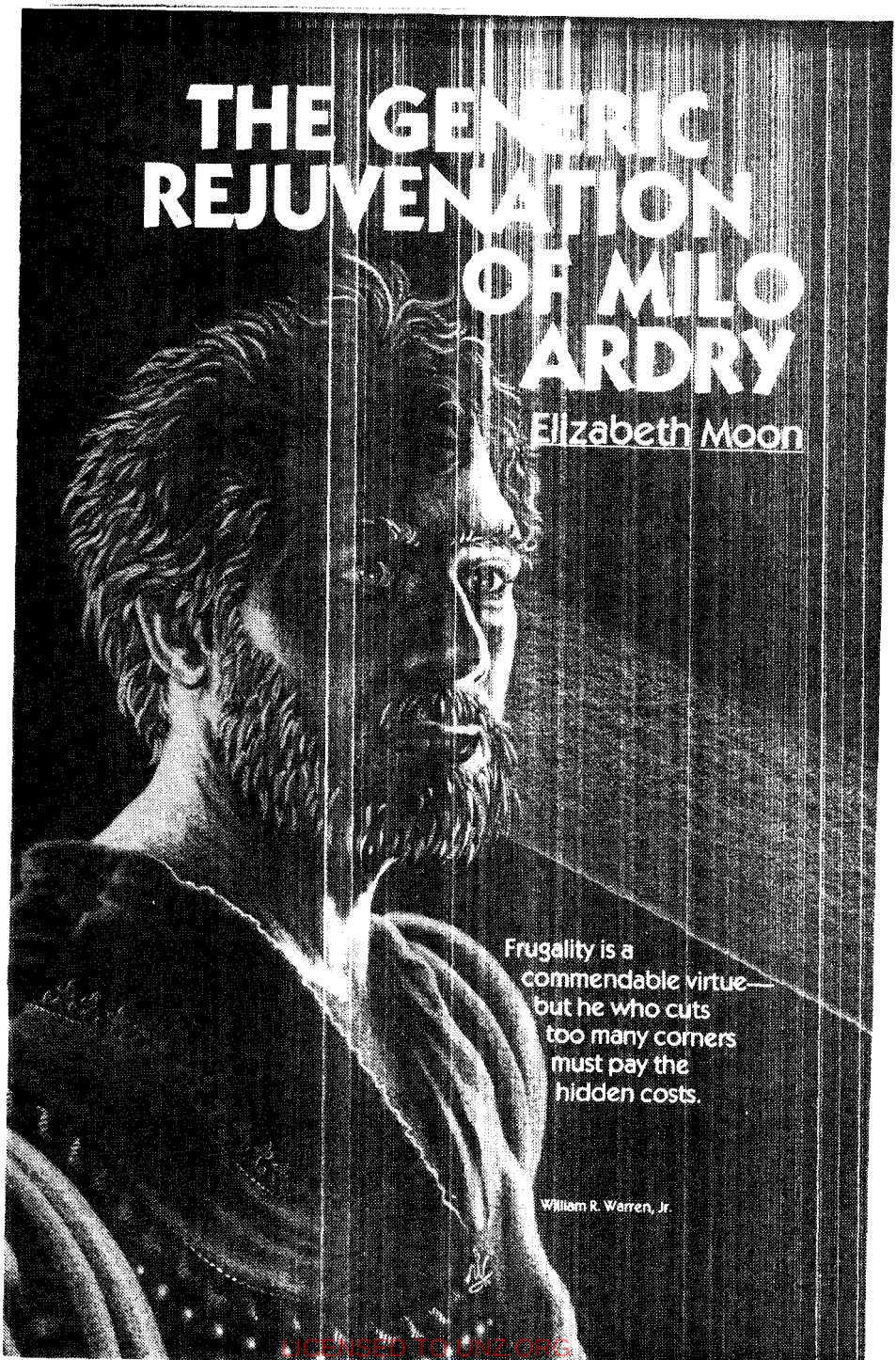
THE GENERIC REJUVENATION OF MILO ARDRY
Elizabeth Moon
Frugality is a commendable virtue— but he who cuts too many corners must pay the hidden costs.
William R. Warren, Jr.

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Before his first rejuvenation, Milo Ardry had not been concerned with the cost. The procedure itself had been new enough, risky enough, and—perhaps most important—*exclusive* enough to justify any expense. He had been seventy, a sleek and pampered seventy but seventy nonetheless, with all that implied about, for example, his prostate. A chance to become thirty again was worth a few millions. He chose *Reverberations*, the first licensee of the procedure, and already establishing itself as the top of the line.

He was one of the lucky ones who sailed through rejuvenation with hardly any trouble. They told him when he woke that it would be the same every time. Either your body took to rejuv easily, or it didn't, and that's the way it went. So Milo went back to his remaining millions with the healthy thirty-year-old body he remembered so well, and rode it hard until he reached nominal fifty. At that point he couldn't see why he should live through the fifties and sixties again, going downhill all the way, and bought his second rejuvenation from *Reverberations*. He was mildly annoyed to find that they charged as much to return him to nominal thirty from fifty as they had from seventy, but—cushioned in one of their famous consultancy suites—thought it too much effort to check out and find another company. Even though it would take most of his reserves, and his children (approaching the need for their own rejuvenation procedures) would complain bitterly, he still felt that he deserved the very best. After a few sarcastic remarks which the *Reverberations* valet, immaculate in formal dress, received in respectful silence, Milo fell asleep and woke up at the age of thirty.

The good years returned: the strength, the concentration, the taste of good food and drink, the delight in women. He hadn't lost *much* between thirty and fifty, but that little was the difference between good enough and splendid, between coming off the court after a fast eight-goal game with the pro, still ready for all night on the town, and deciding to play a couple of friendly goals with another fifty year old. Or even deciding not to play deven at all, to sit out the games and watch.

Musing on this, he decided to rejuv oftener. After all, why not? Why not live at his peak all the time, and not just for the few years it lasted each cycle?

He thought about it, off and on, until the year he reached nominal thirty-five and found himself breathless after water-wrestling Heather and Jeri Brannon (ages 27 and 29) in the Maelstrom. That night he called up his whole financial setup, from asteroid mining to zoological park. He wanted to rejuv every five years . . . at most every ten, if he reverted to twenty-five, but he'd still had a bad complexion at twenty-five. Say seven years. Rejuv every seven years to age twenty-eight, and live until thirty-five, and then another cycle. Why not?

Money, that's why not. He called up the latest *Reverberations* advertisement, fed it into his computer, and stared in complete shock at the display. At those rates, he would be bankrupt in three—at most four—cycles. His net worth still hadn't recovered from his second rejuv: he had to live out at least nineteen years between cycles.

Close after shock came anger. It sim-

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ply was not fair. *Reverberations* charged a flat fee for rejuv, expensive enough if it meant reversing thirty or forty years of aging, but outrageous when the body had only suffered through five or six. Milo grumbled, watching the display, and called his advisors.

They couldn't give him a different answer. At the current rate, he'd be completely bankrupt after a few more rejuvs, and—his legal staff had pointed out—his heirs would almost certainly declare him incompetent for wasting the family fortune to keep one old man young. Milo had glared for thirty seconds at the fancy-pants youngster the legal department had put on the line before realizing that it was the same old Charles Raymond Coatesworth, fresh out of rejuv and a nominal thirty at most.

"I suppose you'd help them," he said sourly.

Coatesworth smiled. "I should have to state my opinion, Milo, that's what it was the last time. Under present law—"

"Which can be changed," said Milo.

"Which hasn't been changed yet," Coatesworth pointed out. "And that's the law we're under. Your heirs have a right to petition the court to have you declared incompetent any time you act in an irrational, unbusinesslike way with their heritage. And *Farnton vs. Kansas*, if you read my memo on it, sets a precedent that your heirs could use to advantage."

"All right, all right." Milo cut everyone off the circuit, and brooded. He hadn't read Coatesworth's memo; he never read Coatesworth's memos. He thought of querying the computer, but it really didn't matter. If his own legal staff were ready to cooperate with those fortune hunters, his miserable whining sons and daughter, he might as well give up the idea of a *Reverberations* rejuv. But that didn't mean aging for twenty or thirty years before rejuv, not any more. Other companies had moved into the expanding market. He toed the control, and called up the figures on them. *Holenew* . . . he'd heard a few stories about *them*. An accountant at the home office had rejuved with them, and died six months later, in agonizing pain from the bone cancers. *OverEasy* had a good reputation, but their prices were only 10% under *Reverberations*. He watched as the list scrolled by alphabetically, then called it again, sorted by price. Never buy cheapest, he'd always believed, so he ignored the bottom five. The sixth lowest was *Revibrations*.

Milo grinned. That kind of humor got to him. He found himself nodding as he read the rest of the listing. Licensed both nationally and locally, as a Class B rejuv service. That meant nothing, really—only the top three firms were Class A, and B ran from "almost as good" to "really sleazy." There were Class C firms that charged more. He suspected that *Revibrations* was about to move up . . . he might be getting one of the last good, cheap rejuvs around. He chuckled all the way to bed.

Revibrations was housed in a plain brick building in what Milo considered "secondary" property. Instead of the white glazed tile entrance, with a blue canopy over carpet, with which *Reverberations* welcomed its clients, the cheaper rejuv service had a strip of green fake grass on either side of a

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stone-flagged walk. Its door was blacked-glass; Milo had to push it open himself.

But once inside, it was luxurious enough. A uniformed guard bowed at him; a receptionist (female, he noted with approval) came forward smiling. In less than a minute he was relaxing in a comfortable leather chair, sipping antique coffee while the Director explained the procedure. Milo concentrated on the flavor in his mouth, and paid little attention. After all, he'd been rejuved before, and at the best place: what could *Revibrations* tell him about it? When the Director fell silent, Milo smiled and signed on the dotted line. He did read the contract—or at least looked at every paragraph—for that basic survival skill of business had never deserted him. But a rejuv contract was full of words he didn't know; all he did was note that it looked much like the *Reverberations* contract which he'd had his legal staff go over the first time. It didn't have any of the "siren" clauses—any claim on his inheritance, any authorization for use of *his* body parts—so he signed.

He gave his medical history to someone in a white uniform, and his credit card to someone with a portable BankChek, and finally his clothes to someone in rumpled green surgical scrubs. He noticed, at points in the procedure, that the *Revibrations* facilities were not as luxurious as those he enjoyed elsewhere. The toilets were clean, but plain and functional: white porcelain and steel. The chairs were a little too firm, not completely shaped to his individual back; the clothes closet was more like a locker. The personnel, too, while competent and polite, showed no desire to give extra service: they almost seemed hurried. But after all, he was paying less than half what *Reverberations* charged.

Milo woke with his usual ease, and knew at once that rejuv had occurred. The light was just that fraction brighter, sounds just slightly clearer. He wore a plain, not-very-comfortable hospital gown, and a technician was only then slipping the last needle from his arm. Milo settled back, ready for a final nap, but felt an insistent tug.

"Come on, sir, up you go." The technician had grasped his shoulder.

"I think I'll just lie here," Milo started to say, but he felt himself heaved upward.

"Come *on* now, sir. Time to go." Before he could protest, he was in a wheelchair, floating down the corridor with the technician's hand on the back cushion. Milo blinked. He saw two litters along one wall, each with its sleeping occupant. Had *he* been left out like that for anyone to stare at? He had no time to ask. The technician twirled the wheelchair into a curtained cubicle, and decanted Milo onto a padded shelf along one wall. "Clothes in there, sir," he said, pointing at a locker that made no pretense of being a closet. "Nurse'll be along to sign you out."

Milo felt the cold draft along his naked back and glared at the cheap green curtain the technician had pulled across the opening. He hadn't been treated with such complete callousness since his father's death, when his uncle had sent him to Camp He-Man, guaranteed to change spoiled rich boys into tough, cooperative, independent young men. As a result of that experience, Milo had

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thrown his uncle off the Board of Directors as soon as he'd gotten on it himself, and his cousins still wondered why "Dear Milo" never had time to see them or an available job in his companies. He did not put up with this sort of thing. Not now. He sat on the shelf, smoldering, until someone called him from outside.

"Mr. Ardry? Aren't you ready yet? Dr. Allison's waiting."

"Let him wait," growled Milo. "I need help—where's a valet?" He hoped the nurse would be pretty—her voice didn't sound it, but voices could lie. But he heard the squeak of her shoes on the floor as she moved away. "Nurse!" he yelled, but got no answer. He was almost angry enough to storm after her, open-back gown and all. His dignity prevented him—young and handsome he might be, rejuved to thirty, but no man looked his best in what was no more than a modified apron.

After another fuming minute or two, when he heard nothing from the hall outside, Milo gave up. He might as well get dressed himself, because he wanted to waste no time before entering a complaint. He stood up, finding himself slightly shaky on his feet, and opened the locker. He had just dropped the hospital gown on the floor, and reached for his LeGentilhomme silk underwear when someone jerked the curtain aside, and he felt a heavy fat hand on his shoulder. What followed was the most humiliating experience since camp, an experience made worse by Dr. Allison, who, when he finally met her, insisted on treating his justifiable anger as a psychological symptom of rejuvenation. "Now, now, sir," she kept saying, and handed him a packet of pills to take. Milo finally stormed out to his waiting limousine, ready to throw several shelf-loads of books at *Revibrations*, just as soon as he could get his legal staff onto the job.

His private medical exam at home, however, was reassuring. Nominal thirty. Milo registered with the government, as the law required, and received his new IDs and a few minutes later: the pictures showing a crisp jawline, dark hair, unclouded eyes. He relaxed, then, in the gray velvet chair he favored (recovered, of course, during his rejuvenation: so careless to let the wear on one's furniture reflect one's true age.) Despite the disgusting lack of courtesy shown by the *Revibrations* staff on the way out, he *was* nominal thirty, and he *felt* nominal thirty, and a long life was, after all, the best revenge. He took a long, satisfied breath, and notified all departments that the Chief was back in command. That evening, when he still had the energy for a double trip through the Maelstrom (in a new black suit that left nothing to the imagination) was the high point of his cut-rate rejuv.

The next morning his troubles began.

In the first place, the old Milo Ardry—the original, who would now, without rejuv, be a nominal ninety-odd—had had prostate trouble. Many seventy-year-old men do, and being rich is no help. There are only a few ways to correct the problem, all of them unpleasant. He had—in those days—been resigned to shortness of breath, crepey skin hanging in loose folds from his arms and legs, wrinkles everywhere, long gray hairs on his back, the bald spot (concealed under an implant, but

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still bald in his mind). But not to that personal and very humiliating difficulty, the proper revenge (his then mistress had snickered before he dismissed her) of Mother Nature on all arrogant males who survive long enough. A "good stream" was something boys were proud of as soon as they learned to aim it more or less; even Rembrandt had done etchings showing that proud difference between men and women. And now—then—at seventy, he no longer had that good stream or anything like it. He strained. He struggled. He—not to put too fine a point on it—dribbled. A function easy—almost thoughtless—for two thirds of a century became an act hard to begin, hard to continue, and excruciating to withhold. Not to mention sex, which he didn't out loud but thought about bitterly.

He had tried the pills, when the first trouble came on at fifty-seven. He had considered—and shied away from—the recommended surgery. But just before his rejuvenation, he had decided to go through with it . . . let himself be reamed out, so to speak, and then implanted with a surgical assist for his pleasure. Luckily the rejuv had taken easily, and he had no more need for urological consultation. His second rejuv was done before he had any difficulty at all. He had no idea just how rejuv worked, or how an old, enlarged prostate became once more the smooth, snug gland he had once had: it worked, and that was all he cared about.

Until the morning after he came home from *Revibrations*. It had been, by this time, twenty-five years since the last time he'd noticed his prostate or—except in delight—any of the attendant organic apparatus. So when he threw off his robe and discovered a haze of blue fur, he was, to say the least, appalled. His own body hair, what there was of it, was black. Not rich, lustrous, brilliant electric blue fuzz.

He touched, pinched, tugged gently. Attached, and evidently growing in place. In the mirrored wall of his refreshment suite, he could see the expression on his face, mingled smirk and snarl. *Revibrations* would never be the same; he would pluck those responsible from their snug little racket as a gull plucks snails from their shells. Blue fur indeed. Then, admiring past the blue haze on his body the taut line of his nominal thirty belly, he braced his legs and aimed.

And nothing much happened.

Milo frowned, and tried again. Quickly connected two and two, and attempted a test of his hypothesis on the expected sum. Sure enough, despite the lean belly and springy feel of his muscles, the clear sight and undimmed hearing, something was missing. Something *important* to Milo, one of the things he wanted a rejuvenation of . . . and for.

Now his face in the mirror was grim, and he dressed quickly for the day's business, of which the first item was the total, complete, absolute beyond all doubt annihilation of *Revibrations*. At his desk, he called up a copy of the contract, and then called Charles Coatesworth for a live conference.

Coatesworth was not as sympathetic as he should have been. "You did not have the legal department check that contract for you. . . ."

"No, but it was the same old thing,

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and I did look for the clauses you'd warned me about."

"Some of them, yes." Coatesworth pointed to a subparagraph. "Notice this?"

Milo peered at it. He didn't really understand all that legal nonsense. "Hold harmless" and "generic substitution of equivalent bioactive material" . . . what was that? There was no way that *Revibrations* could claim that blue fur and urological problems were "equivalent" to the nominal thirty rejuvenation he'd been promised. Coatesworth cleared his throat, regaining Milo's attention, and explained.

"This right here says that they can use generic material in the carrier viruses as well as the bioactives."

"Is that bad?" To no one but Coatesworth, who had been with him from the beginning, would Milo have revealed his ignorance so freely. Now he wished he had not made an exception. The expression on Coatesworth's face had far more contempt than was comfortable.

"Milo, I know you're bright. You always were. But you also always hated to study hard enough to actually learn anything. And what it sounds like now is that you haven't the faintest idea how a rejuvenation works, despite having undergone three of them and signed papers each time that said you did."

"I'm not a doctor," said Milo. "Get to the point."

"The point is that they used generics. Which means we really don't know exactly what they did use, because they didn't have to specify, except in the most general terms. At *Reverberations* and the other Class A licensees, you're guaranteed nothing but pure human-genome, cloned culture material, for both the carrier virus and the bioactives themselves. This means, for one thing, that you don't sprout blue feathers—"

"It's not feathers; it's fur," said Milo. Coatesworth folded his lips together for a moment.

"Have you looked lately?"

"What—?" Milo stared, with dawning suspicion. "No. . . ." Coatesworth nodded. Milo keyed a command into his desk and a mirror slid out of the lefthand side, lifted to face-height, and tilted. There, where the morning's surprise had been a thin blue fuzz on his cheeks, was a fluff of something clearly not hair. Down? He peeked down into the neck of his low-cut raw silk shirt. The heavier growth on his chest was a stage beyond down . . . little blue pinfeathers sprouted, their tips just starting to open. "No!" said Milo with feeling. "Not feathers!"

Coatesworth had fixed his eyes on a sheaf of printouts. "I put this together even before I saw you. The feathers are some kind of interaction between your native hair follicles and the new genetic overlay. It's not as simple as if they'd used bird genes for feathers instead of mammalian genes for hair . . . that we could nail them on. Your feathers are an idiosyncratic symbiotic synthesis. . . ." Coatesworth was clearly enjoying rolling those long words off his tongue; Milo clenched his fists. What he could understand of it sounded as if his hair follicles had rejuvenated all the way back to a primordial nonmammalian ancestor who had feathers. Blue feathers. When Coatesworth looked up, he glared at him; Coatesworth merely looked

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sober. "We can't do a thing about the feathers," he said. "It's a risk you undertook, in writing, without the advice of your legal department, which you chose to ignore." His eyes dropped back to the printouts he held. "But I think we can argue with them about the other problem. You paid for a nominal-thirty rejuvenation, and a urological study will no doubt indicate that your function is not within normal limits for nominal thirty."

"But they can't—I can't—"

"Milo, I'm terribly sorry, but all we can do legally is file for a refund of that part of the procedure detailed as urological. Unless you want to let them try again. . . ."

"NO!"

"I thought not. I've already contacted other firms about a partial rejuvenation, limited to urological. *Reverberations* won't touch it; they say that they can't afford to handle clients who have been contaminated with generic genetic material. Their experts feel that once such material has been incorporated into your body, there's no way to be sure it's all eliminated. And their guarantee would make them liable for any future problems. They did, however, recommend a firm which does partial rejuvenations for medical reasons, when a single organ system has been damaged by disease, for instance. It's going to cost you—"

"It's going to cost *them*," said Milo grimly, his fingers catching on the fuzz of his chin.

"*You*. You're the one who signed that contract. I don't know how many times I've told you not to sign contracts without the legal department's approval. . . ."

"I'm sorry." Milo glared at Coatesworth, who gave him a level look back.

"The firm I'm talking about will do a complete urological rejuvenation to nominal thirty, and they *think* they can isolate and uncouple the insertion that caused the trouble, so it should be a permanent fix, and not something you'll have to deal with in each rejuvenation process."

Milo could think of nothing scathing enough, and was silent, his rejuvenated innards seething.

"They're not so sure about your fertility," Coatesworth said.

"I've got enough damn children," said Milo.

"Then shall I schedule you with them?"

"Yes. As soon as possible. And see if there isn't something they can do about these feathers."

Coming out of a partial rejuvenation was far worse than the whole process. Milo felt as if he'd had major surgery, which even at nominal thirty is not a pleasant feeling. He ached. He throbbed. Parts of him felt compressed and cramped, and other parts felt distended. But as he shifted in his bed, he heard around and above him the kind of deferential, low-voiced murmur he preferred. When he opened his eyes, the gowned nurses at his side had sympathetic smiles. In a very short time, he was able to tell that the procedure had been a complete success. So far as it went.

When Coatesworth came in to see him, Milo was propped up in a com-

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fortable bed eating real oysters (cloned and grown in saltwater tanks far from any contamination) on toast. Coatesworth stood by the door, obviously wary.

"I feel very well," Milo said, in answer to Coatesworth's polite inquiry. He was sure that Coatesworth had access to his medical records anyway. "But what am I going to do about this?" *This* being the blue feathers, now fully sprouted and forming a lush blue covering for his chest under the brocade dressing gown, and a very odd-looking arrangement on his lower face and throat—apparently his distant ancestor had had a metallic purple gorget.

"I suggest using a depilatory," said Coatesworth. "It's bound to clog a razor." And he ducked out before Milo could say anything, or even throw an oyster-laden square of toast.

Milo stared after him, furious. He'd see to Coatesworth, just as soon as *Revibrations* fell to him in court. Depilatory, indeed! For these . . . his fingers stroked the sleek feathers of his gorget. Actually they felt quite luxurious. Elegant, even. He pushed back his tray and rose slowly from the bed, looking for a mirror. There. It was, in one way, grotesque, his handsome face and sleek black hair above a purple-feathered throat, a blue-feathered chest. But in another . . . Milo cocked his head, considering. Simple rejuvenation could be boring, actually . . . returning to the same old body over and over. However handsome it had been, fashions changed.

The door opened suddenly, and his favorite nurse hurried in. "Mr. Ardry, sir, you shouldn't be out of. . . ." She stopped; in his excitement, he had *fluffed* those colorful feathers; now they flattened again.

"I suppose you think they're ridiculous," said Milo in his most winning voice.

"Oh, no." The nurse took a long breath. "Actually, Mr. Ardry, I think they're . . . they're. . . ." Her hand reached out as if to stroke the glossy blue, then withdrew.

"Pretty?" asked Milo.

"Sexy," said the nurse, flushing. "I wish *I* could have feathers. . . ."

Milo beamed at her. He had been right; it was time for a change, time to set a new fashion. First he would break *Revibrations*—why should they profit from what was, after all, only an incompetent accident on their part? Then he would fire Coatesworth, for not having the vision to see the possibilities in human plumage. And *then* he, Milo Ardry, would reappear in society, once more in the forefront of that fashionable, luxurious life he never meant to leave. Others would want feathers (or fur, or hooves, or tails, or scales), and he would own the process. He could afford as many rejuvenations as he wanted, as often as he pleased.

"You shall have feathers, my dear," he said, imagining himself leading her, feathered in pale green, into the most exclusive clubs. That should be enough to start. . . . "You shall have as many feathers as you like." ■

●The universe is not only queerer than we suppose, but queerer than we *can* suppose.

J.B.S. Haldane

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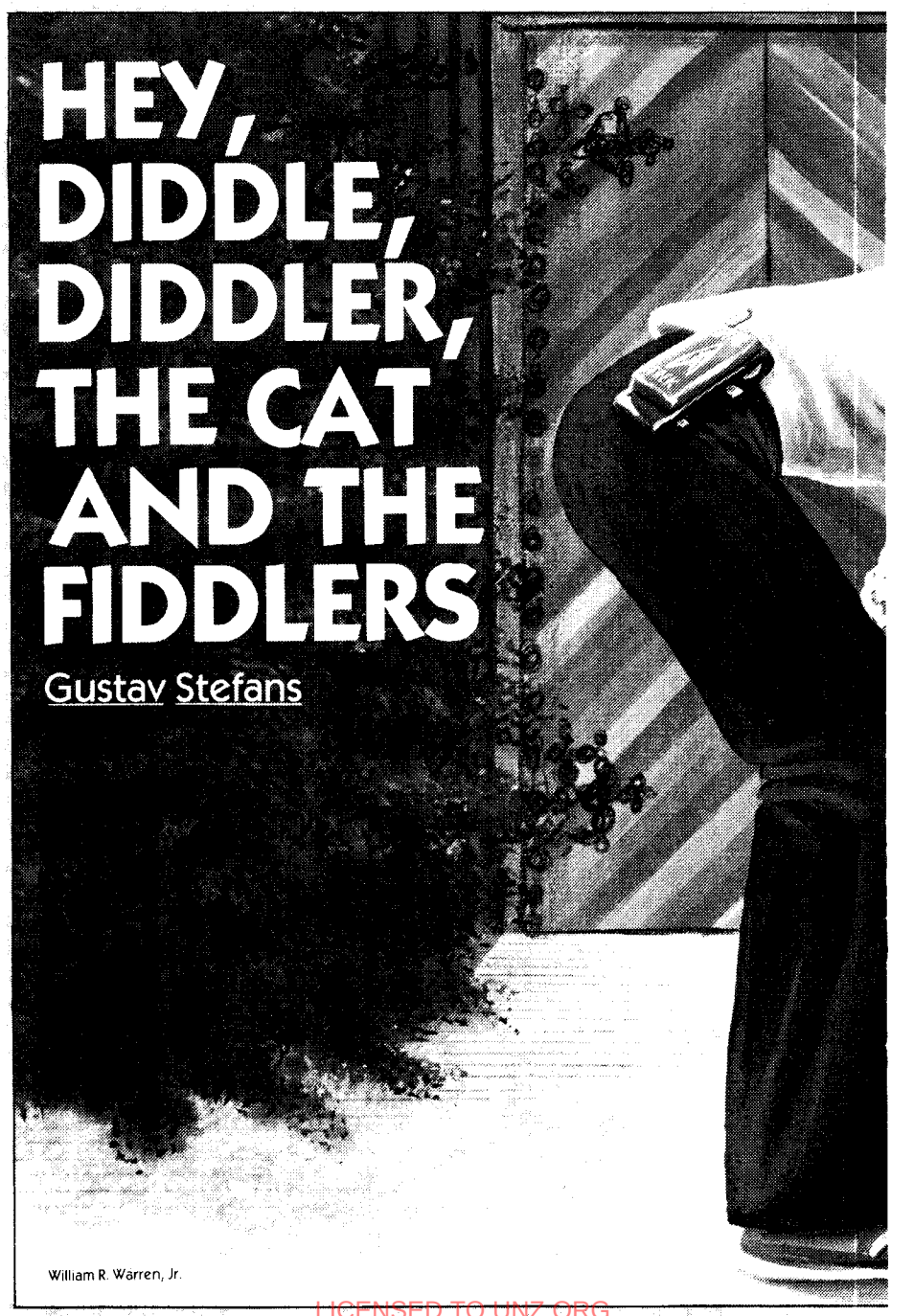
HEY, DIDDLE, DIDDLER, THE CAT AND THE FIDDLERS

Gustav Stefans



William R. Warren, Jr.

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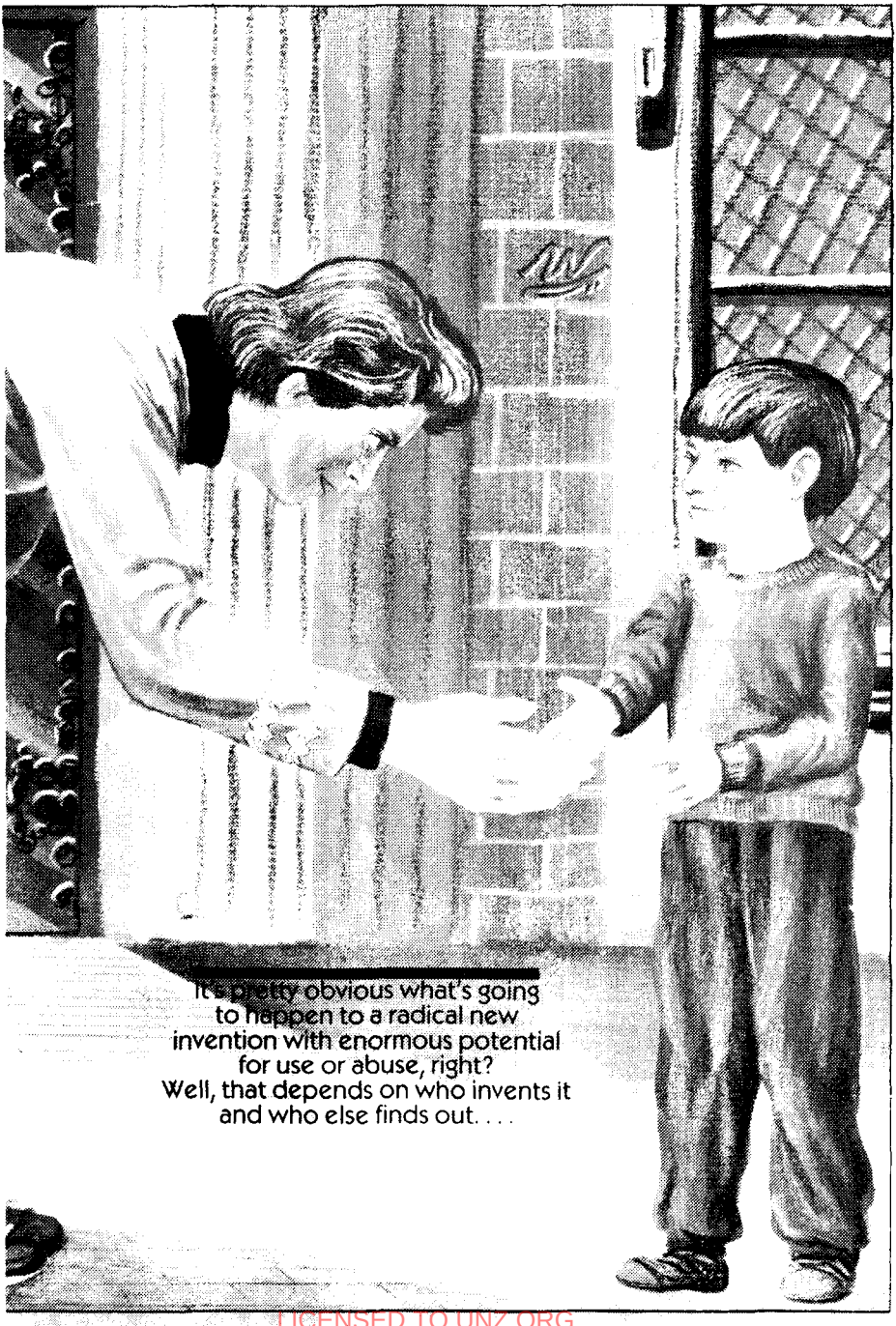
It's pretty obvious what's going
to happen to a radical new
invention with enormous potential
for use or abuse, right?
Well, that depends on who invents it
and who else finds out. . . .

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I.

The Smithsonian Institution,
Washington, D.C.—

"Mommy, Mommy, look!" The small boy tugged on his mother's handbag. "Just like on that TV show! Can I go see them? Please?"

The woman turned and looked in the direction her son was pointing. She stared a few extra moments at the two figures, then glanced around the area. "Uh, all right, Bobby. But remember your manners: Please and Thank You."

"Yeah! Thanks, Mommy!" Bobby raced over to the two figures, who were studying the Smithsonian's Administration building. He stopped suddenly, three steps away, and walked carefully over to the figure whose shirt was gold-colored. "Uh . . . please, sir. Are you a captain?"

The man turned, looked down, and smiled. "Sorry—are you talking to *me*?"

"Yes—sir." The boy hesitated, uncertainty showing clearly on his face. "I thought you were Captain Kirk. Did you beam down from the *Enterprise*?"

The man squatted to put his eyes on a level with the boy's. "No, we came from another . . . ship. And what's your name?"

"Bobby. I'm six years old. Is your ship orbiting right now?"

The man in gold turned to his companion, whose shirt was blue. The other man looked at Bobby, then turned his gaze to the first man; his expression, with one eyebrow almost hidden beneath his black hair, more closely resembled a shrug than any movement of his shoulders could. The man in gold turned back to the boy.

"Yes, our ship is orbiting right now. Um . . . we're down here making some observations before we leave orbit." The man's face brightened. "Say, could you do me a really big favor? Would you promise not to tell anyone that you've seen us until after we've gone? Our mission is, um . . . kinda secret." The man in blue suddenly had trouble breathing.

Bobby's gaze bounced back and forth between the two men. "I already told my mommy," he said apologetically.

"That's all right. Mothers are expert at keeping secrets. But no one else —okay?"

Bobby brushed his hair out of his eyes and rubbed his cheek hard. "Only if you promise to take me aboard when you get back."

"Deal."

The man extended a hand. Bobby shook it, with six-year-old enthusiasm. Then he spun around and raced back toward his mother.

"Mommy, Mommy, guess what! They're the real thing! They really do come from—"

The man in gold turned to his companion, who returned his gaze. "The logical strategy now would be a rapid retreat."

The first man's gaze lingered on the other's face while he pulled a small box from his belt. "Do you know you're beginning to sound like him? I think you'd better change out of that uniform before your blood turns green, Karl." He slipped the box open before blue-shirt could reply. "Bernie? We're ready to come back. Have our position? Okay, we'll wait."

"Do you want to tell him about our

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'secret mission,' or shall I?" Karl said through a big grin. "I'm sure he'd love to hear about it."

"And I'm sure you'd love to tell him. And—'You'll be immensely pleased with yourselves for at least a month . . . sir!' " Gold-shirt sighed. "That's all I need—to play a practical joke on myself—Hello! Ready? Okay—energize!"

Bobby turned around just in time to see the two men in Starfleet uniforms disappear in a single burst of bright light. He yanked hard on his mother's handbag and yelled, "There they go, Mommy! Quick! Look!"

Bobby's mother spun around and grabbed his arm. "Listen, young man, I warned you about pulling on my purse like that! Now you behave yourself or else I won't take you to the Air and Space Museum! Do you hear me?"

"But Mommy—"

"No buts! Now come on!"

Bobby looked forlornly at the spot where the men had disappeared, but dutifully followed his mother.

The room was a little wider than a corridor, with four open closets, standing side by side, replacing one of the longer walls. The wall opposite the closets contained the door leading into a large bathroom; the remaining walls sported doorways leading into dormitory rooms at opposite ends of the 'corridor.'

At the moment, the space at one end of this room was occupied by a raised platform with a handrail, supported waist high, above it. Encased in a tangled network of wires, the handrail was slighter larger in diameter than the platform. Several more wires emerged from the tangle, at equally spaced intervals. They ran to the floor and over to a neat but apparently handmade console on the opposite side of the room. A short figure with bright red hair stood beside the console, intently studying its control panel and making adjustments.

Satisfied, he rammed home a switch with one hand while covering his eyes with the other. A blast of white light inundated the room for a fraction of a second. When the light dissipated, the two men, one in gold and the other in blue, were standing on the platform and rubbing their eyes.

A few moments later, blue-shirt stepped down off of the platform and addressed the red-headed man. "Hey, Bernie, guess what? Gus and I were on a 'secret mission'!"

The man in gold stopped in mid-step, glared at his companion and muttered something unintelligible.

Bernie turned away from the console, his bright red head shaking slowly. "I said giving him that gold shirt would go to his head. Next thing, he'll be ordering us to swab the deck."

"In your case, I'll settle for a once-over with a vacuum," Gus replied, scowling. "Look, guys, that was the best thing I could think of on short notice. Next time, *you* can fend off the kids!"

Bernie walked over and clapped him on the shoulder. "But Gus, you're a natural for handling kids. Just think—with a little more work, you might make it up to teenagers!" Bernie barely kept his laughter under control.

" 'You might make it up to teenagers,' " Gus mimicked, his scowl deep-

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ening. "Bernie, you're the only guy I know who can take a simple declarative statement and turn it into a straight line."

"Of course. When you're the best, anything is possible," Bernie declared, finger upraised. "When you tangle with me, prepare to get burned!"

Gus leaned forward, about to speak, when Karl interrupted. "Is being burned by Bernie worse than being gassed by Gus?"

Gus turned incredulous eyes toward his friend, who was barely keeping his laughter contained. "You—You—guys . . . !" Gus's gaze swung from one to the other. Neither was attempting to hide his mirth now. Gus, red-faced, started to say something, checked himself and took a deep breath.

"All right—all right. Truce, guys . . . please? For a few minutes, anyway. There's something we need to talk about."

"Not bringing in outsiders again? That subject is closed!" Bernie said, his mood changing instantly.

"Bernie, I don't like the idea any more than you do," Gus answered, "especially after the treatment I got from those professors I talked to. But I haven't felt right using this thing ever since you tried to put me into my dorm in Area III and dropped me into the pool in the old gym instead. We still don't know that much about how it works." He indicated with his thumb the apparatus behind him.

"Fine. Who do you propose to ask?" Bernie threw out. "No one who's qualified to help us would believe the transporter is possible, even if we demonstrated it. And I wouldn't trust anyone who believes it based only on our telling them."

"Now, wait a minute, Bernie," Karl spoke up. "I disagree with that. There are one or two professors over in Physics who I think are open-minded enough to discuss something like this."

"Sure, they'll discuss basic principles, but will they help with details? I know the basic operating principles of my car, but that doesn't help fix the transmission or build a better carburetor. You're talking about detail work, and I say we can't risk letting anyone else get that close."

Gus sighed. "All right—your point. So what do we do, tinker with it in our spare time? I don't know about you guys, but I've used all my spare time and then some. If I get any more behind in Partial Diffy Q, I'll really be in trouble."

"You're not the only one!" Karl practically shouted. "If I get any further behind in Statics, I'll have to drop it."

Bernie clucked his tongue and slowly shook his head. "Oh, ye of lesser minds—I thought by now some of my superior intellect would've rubbed off on you, but I guess it'll take more time."

Gus and Karl looked at Bernie, than at each other. "Do you want high or low?" Gus asked.

Karl hesitated, glanced at Bernie's smirking face again, then turned back to Gus. "High."

"Right." With a yell, both of them charged the chortling Bernie, who dodged their first attack and led them on a merry chase around the tiny room.

The dorm room door slammed open

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to reveal an angry Gus. He stomped past before it had a chance to catch him on the rebound. Throwing his briefcase onto the upper bunk, he marched the four steps down the length of the room, roughly pulled out his chair and sat down hard. After fuming a few moments, he bounced up and circled the room, striking anything within reach, including the steel bedframe. After one particularly painful punch, he sat down on the lower bunk and choked out a hoarse "Damn!"

Karl appeared in the doorway leading to the closet-bathroom area. "I thought I heard you come in. It was either you or the Incredible Hulk." When Gus didn't smile or look up, Karl's tone became serious. "What's wrong?"

"I just got my Partial Differential Equations test back. My grade—I didn't need that. I didn't need that, especially now! Especially after that fiasco over in Physics yesterday!" Gus punctuated his statements with a clenched fist striking the bed. "I studied for that damn test! I worked math problems for three hours that I should've spent on my other homework! I went to see him in his office every spare minute I had! And now, this!" He punched the bed, intending to put a hole in it, but the soft blanket absorbed the blow.

"How bad is it?" Karl asked gently. "The test?"

"Everybody else in the class seemed to think it was pretty easy. At least they passed!" Gus paused. "What's wrong with me? Why can't I make sense out of this stuff? Why?"

Karl waited until his friend's ranting finished. Then, he stepped over and leaned against the upper bunk. "What are you going to do?" he asked, his slight southern accent a soothing counterweight to Gus's anger.

Gus sighed. "I'll have to drop it. I don't have much choice." He took a deep breath, then: "Damn! I wanted that course. I need that course!"

"What do you need it for?"

"The people I've talked to give it a strong recommendation if I want to go any further in physics. Especially relativity."

"You can take it again later, can't you? It's not as if you've been barred from it."

"Yeah, I can take it again, I suppose." Gus ran a hand nervously through his short brown hair. "I just feel like there's something wrong with me—that after I've worked so hard at it I should've gotten somewhere."

"Oh, boy, do I know that feeling," Karl said, nodding. "I don't think I'll ever forget how many hours I put into Thermo before I made any sense out of it."

"But that's different—we're supposed to take Thermo to 'broaden our engineering background'; I don't expect to even see it again. Partial Diffy Q is supposed to help me describe the transporter's operation, which makes it useful—as opposed to a lot of the stuff we have to take."

"I quite agree. Unfortunately, short of demonstrating it to the faculty, I don't see how we can convince them of that."

"Yeah, I know," Gus replied sourly. "Oh, well. I guess I'd better head over to the Registrar's office and pick up my drop slip." He stood up and stretched. "Wanna come along?"

"Yes. As a matter of fact, I have an

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idea that I believe you and Bernie would appreciate. Especially now.''

''Oh? What's that?'' Gus asked, reaching for his briefcase.

''Popping in and around various parts of the country has been fun, but I'm ready for something new. Something a little more—exciting.'' Karl chuckled.

Gus turned a blank face toward his friend. ''Like what?''

''Well,'' Karl began, his voice warming to the subject as they proceeded out the door, ''suppose instead of just dropping in on these places, we started leaving a calling card—''

II.

The SAC commander had just sat down at his desk with his morning coffee when the telephone used for classified communication buzzed at him. He stifled a yawn as he groped for the handset, found it, and picked it up. ''McClellan speaking,'' he said. In the next instant, he came fully awake. ''You demand *what?*'' he bellowed.

The reply sent his blood pressure up ten points. ''No, this is not Pizza Hut! Who is this? What are you doing on a secure line? Identify yourself imme—!'' He pulled the handset away and stared at it. Its dial tone blared insultingly at him.

It took only a quarter of a second for the general's anger to break through his surprise. His face crimson, he slammed the handset down and punched the intercom button.

''Yes, sir?''

''I want Major Crippen and the O.D. in my office—now. Not in ten minutes. *Now.*''

''Yessir! Rightaway sir!''

His anger partially vented, the general stared at the door for half a minute. He pulled out the top drawer of his desk, removed a report and flipped through the pages. He slammed the report down on his desk a moment later.

''If those FBI idiots are testing my security again, I'll take them out and shoot them myself!''

The sergeant unconsciously scratched his chest through his freshly washed Army fatigues while scowling at three rows of newly-painted, glistening pink jeeps. His stare went up and down each row, checking each vehicle in turn. At the end, he turned and stared again at the pink block that lay next to the huge mound of regulation green and brown.

He stared at it for one full minute, then threw a tantrum for three full minutes. Meanwhile the corporal quietly and, he hoped, imperceptibly, had been sliding toward the door. He was within a hand's reach when the sergeant pinned him with a finger.

''You, soldier, are going back to your platoon. You're gonna bring them here, double-time, and we are going to have a special cleaning detail. While we are on this detail, you are going to stand watch, keeping everybody—I mean *everybody*—out. If any officer comes within a hundred yards of this place, you alert me and keep him occupied for ten full minutes. Understood?''

''Ten minutes—sir?''

''That's right. And if anything goes wrong, you are going to take the K.P. detail for every man in the outfit for a month. Do I make myself clear?''

''Y—Y—Yes, sir!''

''So what are you waiting for? Move!''

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* * *

The project engineer paused with his morning coffee halfway to his mouth as he stared at his newest employee. "What did you say was missing, John, and had been replaced by what?"

The younger man took a step back. "I—I told you you wouldn't believe me, Mr. MacEisley. T-They used to play jokes like this on me at Lockheed, but I-I thought here—"

MacEisley took a sip and put a hand on John's shoulder. "Look here—just calm down. I'm not blaming you for what's happened; I just find it hard to believe. Why don't we take a look at it together, okay?" Gently but firmly MacEisley directed the younger man into the classified laboratory area.

Once inside, John's finger wagged at the one of the larger cabinets. "I didn't notice it until I went to look up the part numbers on the new chips we got in last week—"

His voice squeaked on, but MacEisley wasn't paying attention. The supervisor frowned as he sipped his bitter coffee and studied the shelves that yesterday had held the design texts and application notes that were an essential part of their work. This morning those same shelves contained, instead, copies of *The Sensuous Man*, *The Sensuous Woman* and *The Sensuous Couple*, plus several issues of Penthouse.

"Where are the data books?" MacEisley asked.

"I don't know," John answered. "I looked, but couldn't find them anywhere. Unless they're locked up in someone's desk . . . "

"I want to see Geiger when he comes in," MacEisley said firmly. "He's gone way the hell *too* far with this one—"

"Chief, run that by me again. Real slow."

The Navy captain and his executive officer both watched the chief, who took a deep breath to steady himself. The chief's pale complexion didn't come from seasickness.

"At oh-eight-hundred hours today, I went to check the ship's supply of toilet paper. I found every roll covered with these." He motioned toward two dollar bills lying on the captain's desk.

The captain waited a moment. "Well?"

The chief sighed. "No, sir. It's—It's some sort of practical joke. I've seen a gadget that'll print dollar bills on any kind of paper. I think that's what's happened here, sir."

"The ship's entire supply is like this?"

"Yes, sir."

The captain's stare turned to the executive officer. "Why bring this to me?"

The executive officer cleared his throat. "Well, sir, when the chief told me about this, we both went to check it out. By the time I reached the supply locker—it was empty."

"Empty! Are you certain?"

"Yes, sir. We checked all the other lockers, but there was no trace of the paper. I believe word got around about what happened and—I thought you should talk to the men, sir."

The captain stared at the two men in front of him, then at the phoney money on his desk. He muttered an obscenity.

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"I'll talk to the crew, all right. Okay, dismissed."

The two men saluted smartly and left. The exec had just made it to his quarters when a voice behind him turned him around. "Yes, what is it, lieutenant?"

"I was sorting through our signal flags, sir, when I noticed that half of them are missing. These were in their place." He handed a flimsy, colorful cloth to the exec. "I'm not sure, but it looks like women's panty hose—"

III.

Phil Branch sat at his desk in an odd corner of the FBI building, his bald head bent over a report. The three other desks in the office were unoccupied. The afternoon rush-hour traffic outside the window was nearly over, and Phil rapidly progressed through the stack on his desk in the relative peace and quiet.

Another man swished into the office, closing the door silently behind him. He was astonishingly graceful for a man of his bulk. He fell into a chair in front of Phil's desk just as Phil finished the last report and filed it into his outbasket.

"Speak to me, Philski. Tell me something good."

Phil rocked back in his chair, his thin Santa Claus face wearing a frown. "You wanna hear something good, Alfie? I tell you what I gonna do. I gonna leave outta your name when I talk to the newspaper people. How's aboutta that?"

"Hey, c'mon, Phil. Simmons just wiped my ass with sandpaper; don't you give me a rough time, too."

Phil started to say something, then cut himself off. "Sorry, Al, but I'm mad as hell about this retirement business."

"I know, I know," Al sighed. "I keep shouting at those blockheads up there that you're the best damn agent we're got, but they look at your age and your salary and give me bullshit about needing new blood." He propped one foot up on a desk.

"And what am I supposed to live on? My pension? That's so pitiful, I'd have to own a gold mine to be classed as poor!"

"Hell, I don't know. I stopped listening to them years ago. Always gave me fucking headaches." Al looked out the window. "Damn it, there was something I came in here to tell you—and now I can't remember what it was!"

"Losing your mind, huh?" Phil chuckled. "Want me to whip up a new one for you? Only take a minute."

"Sure! But put it in a new body—you know, with blinking lights for eyes and ears that wiggle. I'll send *it* to those goddamn staff meetings and maybe I could get some decent work done!" They both laughed heartily.

There was a pause after their laughter died. Phil sighed. "Remember during the War, Al, when you knew who you were fighting? In spite of the upper brass getting in the way, you could see who was the enemy and who was your ally."

"Yeah, I remember. Nowadays —damn, I still swear somebody put a tap on my home phone. Just because my oldest kid marched in a few anti-Vietnam protests, I'm suspect! Shit, I don't need that—especially not on top of the bureaucratic mess we work in."

"Speaking of kids, that's another beef I have: who's teaching the new guys coming in? A college degree doesn't teach 'em about proper security

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measures or handling field assignments. Nor does a week in a classroom or watching a videotape. If I'm being removed from active duty, they ought to at least let me teach the new hires. Putting us old guys out to pasture is a big waste." Phil stared at his friend, daring Al to contradict him.

"Goddamn it, why didn't I think of that!" Al exclaimed, his face lighting up. "Quick, give me a piece of paper. If I can transfer you to another department, that'll get Simmons off my back and I can use you as a consultant—" Al had been scrambling around the desk nearest him, but stopped when he saw a file in the desk's incoming box. He picked up the file and glanced through it. "Damnation!" he bellowed.

Phil looked up at him. "What is it, Al?"

"This is it," he replied, waving a stack of papers in one hand. "I talked Simmons into giving you one more assignment—some routine checking. Seems there's been some funny business popping up in a lot of high security areas. Simmons was itching to dump it on one of the new guys. I made sure the damn envelope had your name on it, but I'll bet the SOB crossed your name out so whoever delivered it would just drop it on the nearest available desk!" He dropped it onto Phil's desk. "Here. Take a look."

Phil glanced at a few pages. "What kind of funny business?"

"Strange phone calls, essential equipment missing, some odd grafitti written on blackboards—like that. A big stack of reports with the details will be coming along pretty soon."

"Reports!" Phil exclaimed. "Al, I just finished last month's reports! I'm climbing the walls! What kind of sadist are you?"

"I'm the kind who feeds straw to the bureaucratic donkey in order to keep it from planting its rear shoes on your ass," Al said with a straight face. "Look through 'em. If you can give me a half-baked reason, I'll get you back in the field."

"Okay," Phil sighed. "I guess it won't kill me to read a few more." He watched Al stand and turn to leave. "And thanks. I should know by now what kind of friend you are."

Al smiled, turned, and walked out.

A week and a half passed before Al slid into Phil's office again. As before, it was around quitting time, but this time the windows were shut to seal out the traffic noise.

"Hi there, Alfie. Pull up a chair."

"How about a couch? My ass is killing me." Al fell heavily into the nearest padded chair. "Ouch! Dammit, these chairs are supposed to be soft!"

Phil grinned, dragged a thick cushion out of a drawer and tossed it to his visitor. "Here, try this."

Al did so. "Ah-h-h. Could use a little more, but this'll do. Thanks, Philski."

"Sure thing, Alfie." Phil pulled out a pipe and started lighting it. Puffing, he said, "that file you gave me a week or so ago . . . did you read it?"

"Hell, no. I have enough bullshit to wade through. Why?"

"I was wondering if your intuition was working overtime, or you were just giving me busywork." Phil paused to light his pipe again. "It looks like a bunch of random incidents, practical

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jokes that either came too close or crossed over the security line. I repeat, they look like random incidents."

"I have a hunch I'm not going to like this."

Phil smiled. "While I was reading, I noticed that a bunch of them happened pretty close together—a little *too* close together. I dug out some earlier reports and took them all over to a friend of mine at George Washington. He teaches math—probability and statistics. We dug through it, and he did a rough analysis. The results were . . . ahem . . . unusual?" He stopped talking and stared.

There was a pause; Al fidgeted. "Okay, what did you find?" he said, annoyed.

"The number of incidents took a sudden upswing over the last two years."

Al waited. "So? Maybe more are being reported."

"I thought of that, too. But a few phone calls I made indicate that nobody's reporting any more than usual—rather, more are occurring than before."

Al sighed. "So we have more practical jokers running around now. So what?"

"Are they practical jokers, Al? Or are they something else?"

"I don't follow you."

"Let me give an example. There was this friend of mine, named Ben, who was supposed to parachute into occupied territory in the early days of the War. He did, but landed almost a hundred miles away from where he was supposed to—and close to a town that had SS as well as regular troops in it.

"Now, we'd been trained to lie low and wait until either the area was clear or we could sneak away. But Ben was a clown: he buried what gear he had and stripped down to his shorts. Then he walked straight into the town. Once there, he acted drunk: stumbling, half-walking into everything, and cursing loudly and frequently. When the krauts picked him up and questioned him, he spun out a yarn about getting married soon, and trying to get home from his bachelor party. He gave them the idea that his drunken friends had taken him for a joyride and dumped him off the road. He was convincing enough that they put him on a truck going back to the place he was supposed to be."

Al was silent for a few moments. "Bullshit. Bull-shit. A spy ring playing practical jokes? Hell, if that isn't the most ridiculous thing I've ever heard—"

"Precisely, Al. Ridiculous. Absurd. Goes against everything we know—which is what makes it brilliant. Who would suspect?"

Al studied his friend closely. "Philski, if I didn't know you so well, I'd swear you were making a bass-ackward attempt to hang onto your job. So what comes next?"

"I'm not sure, Al; I need a favor from you. I want access to a computer system and someone to help me use it."

"What in hell for?"

"To keep track of these incidents. See what the target, or targets are. Then try to catch them in the act."

Al snorted. "The first goddamn reasonable request I get from you in ten years, and I can't grant it. I need more, Phil; something to carry this past that bastard, Simmons." He thought for a few minutes. "Okay, I got it: send me

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a memo. Make a prediction of what's coming, and when. If you're close, I'll carry it up as far as I can; if you're off, I'll trash it and you can try again." Al rose.

"All right, Al. That sounds fair. By the way, can I borrow Janie for this? I never got the hang of writing bureaucratese."

"Yeah. Just send the drafts to me and I'll give 'em to her. So what next, oh Swami? I still can't decipher your handwriting."

Phil leaned back in his chair. "It's gonna escalate, Al. I'm not sure how or when, but I think our 'practical jokers' will start putting in personal appearances . . . soon. Or maybe their stunts will get a little outrageous."

"Like what? Park the director's car inside the White House?"

"You said it, Al; I didn't." Phil was almost smiling.

Al studied his friend closely, then frowned. "There are times when I wish you weren't the best agent I have." He turned and stomped out.

IV.

The two guards walked down the hallway slowly, making the routine end-of-day security check. They alternated, one watching while the other made sure each door was locked securely. The older man, proceeding methodically, gave each knob a twist in both directions before trying to push the door open. The younger one impatiently hit the door with one hand while twisting the knob with the other.

At the fourth door the older man paused, tried the doorknob again and reached for his walkie-talkie.

"Whatsamatter?" his companion muttered, his hand on his gun.

"This door. The deadbolt is locked but the regular lock isn't. I'm going to check if this room has another door." He thumbed the radio on and spoke rapidly into it. Neither guard noticed the figure walking up behind them.

"Right. Over and out," he finished. As he returned the radio to his belt, he said over his shoulder, "Bill, cover me."

"Will do," Bill answered, hand firmly on his gun. He jumped at the voice behind him.

"Could you direct me to the nearest toilet facilities?"

Bill spun a little too far, and caught a glimpse of a tall, dark man beside him. He relaxed a little and pointed down the hall. "Sure, down there, end of the hall, just past the . . . swinging . . . doors . . . " His voice died and his hand dropped as he got a better look at the man.

"Thank you. Live long and prosper." The man raised one hand, separating the two pairs of fingers into a V. He turned and marched down the hall, leaving Bill to stare at his back.

Bill's head snapped back and forth as he tried to listen to his partner and watch the stranger at the same time. He turned back just in time to hear Rod say, "—know any better, I'd say someone's been rifling through the files in here—"

Something clicked in Bill's mind. "Rod, call the O.D.! The guy didn't have a badge!" Before the expression on Rod's face could change, Bill shouted, "halt! Stop or I'll shoot!" He took off after the intruder, trying to draw his gun while running at full speed. The in-

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truder's answer was also to start running.

Alarms went off all over the building just as Bill pulled out his gun. The terrific din made Bill pause, face clenched in pain, just long enough for the man to reach the swinging doors. Bill chased after him, trying to re-holster his revolver and keep his quarry in sight. The man pushed through the door on the right and left it swinging wide. Bill tried to slip through.

The door had other ideas: it struck him broadside and threw him into a short side corridor containing drink and snack machines. He bounced off one machine, staggered, caught himself, threw himself back into the main corridor and across the hall, toward the men's room door. Just as he opened it, a blue-white flare caught him full in the face.

Rod arrived a few moments later. Bill was sitting on the floor, leaning against the wall, with one arm covering his eyes. "Bill! You all right?"

"Yeah, I think so. I'm seeing spots in front of my eyes you wouldn't believe."

"Anything broken?" Rod was checking Bill's arms and legs.

"Naw—Just bruises. Damn door! Didja catch him?"

"Catch who? All I saw or heard was you shouting and running down the hall. What did you see?"

"A guy with green skin and pointed ears. Looked oriental—"

Rod looked at his partner. "Can you walk? I want to get you over to the Med Center."

"I think so. Gimme a hand." Rod bent down to help his partner up. "Rod? Do me a favor, will you?"

"Sure. What?" Rod turned Bill toward the swinging doors.

"If I get itchy for action again, shine a light in my eyes or pop off a flash bulb in front of me, okay?"

"Yeah, uh, sure." Rod frowned in confusion, then looked again at Bill covering his eyes. The older man promptly stepped up his pace.

The two Army M.P.'s lounged in their station as night fell over the base. Their conversation was relaxed but minimal, just enought to pass the time but not take their attention away from their surroundings. One started relating a joke when he was cut off by a loud noise; it sounded like a bunch of cats howling in pain. Both he and his companion spun around to face the general direction of the sound.

"What in hell—?"

"It's comin' from over that way." The smaller man pointed toward the compound. "I think it's comin' from the barracks, Jim." He grinned. "Wanna toss to see who checks it out?"

"No, I'll do it. My turn for excitement," the other sentry said as he checked his pistol, holstered it, then marched off into the dark. The sound had started again, now joined by an instrument playing a melody. The remaining M.P. stood in the booth, listening. Suddenly, his face lit up.

"Bagpipes! Well I'll be—!" He almost jumped out of the guard's station, but suddenly remembered he was alone. "Damn!" he muttered. Then he shrugged. "No use asking for trouble."

Soon, though, he was tapping his foot

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and nodding in time with the music. He heard cheers and applause during the pauses, and occasional shouted requests. During one pause, however, he froze when a voice clearly and loudly announced, "At-ten-hut!"

Silence crashed like a tidal wave, sweeping away the joy of the moment. Then a voice trumpeted out of the darkness, and caused the sentry to thank the Lord two or three times for telling him to stay put.

"What's going on here? What's that *noise* I heard a few minutes ago? What—?" The officer's voice still squeaked at random, but the sentry wasn't smiling. He was wondering what the lieutenant saw that made him stop.

"This man's out of uniform! What do you have to say for yourself, Mister?" A derogatory noise belched from the drones. There was a moment of silence, and then, "That's insubordination, Mister! I'm putting you on report! Guard!"

The last screech sent the remaining sentry flying out of his post toward the sounds. "Here, sir," both M.P.'s said simultaneously. They glanced at each other, then stiffened as they faced the lieutenant.

The officer looked at both men, then pointed at a figure standing to one side, holding bagpipes and wearing a Scottish Highland costume. "Put this man on report! And escort him back to his quarters! Immediately!"

"Yes, sir." Jim stepped forward and grabbed the piper's arm. The drones gave a brief howl. The sentry started to lead the piper away, speaking to him too softly for anyone else to hear.

The lieutenant, meantime, had spun around and taken a few steps toward his own quarters, when a brilliant flash lit the area brighter than daylight. The officer whirled toward the flash, then turned away, covering his eyes. After the light dissipated and their eyes adjusted, the three men stood staring at each other. The M.P. noticed several men from the original crowd retreating into the shadows.

"What happened? Where's your prisoner?"

"Uh . . . prisoner, sir?" the big sentry asked, blinking.

"The man I put on report! You were escorting him to—to—"

"There's no one here, sir." Jim's face was innocent.

"Don't give me that! I saw him! You saw him!" The lieutenant whirled, looking for a witness to corroborate him. Seeing no one, he spun again, and caught the smaller guard by the arm. "You! You saw him, didn't you!"

"Saw who, sir?"

"That idi—That damned piper!"

"No, sir. I was checking out the flash I saw a few minutes ago. I thought Coporal Rogers was in trouble, sir." He nodded at his fellow sentry.

The lieutenant whirled around and around. By that time, the area was deserted except for the officer and the two sentries.

"I'm putting this whole unit on report! I'll break up this circus even if it means taking this base apart! I'm going to—" The rest was unintelligible as the lieutenant stomped away.

"The shit's really gonna hit the fan, now. But, hell, it was worth it!" the smaller sentry choked out between laughs.

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"Not this time, it's not," his companion said simply.

"Huh? Whaddaya mean?"

"If he slaps us with extra duty, I'm complaining to the commander. When he has to explain the extra assignments, he'll give his story about a guy playing bagpipes. On the base. Whom nobody saw enter, or leave. And, I'll bet a lot of guys never saw him at all." Rogers smiled. "We'll finally be rid of that jerk."

The other soldier's face cracked into a wide smile. "Jim, ol' buddy, I didn't think ya had it in ya."

"There's just one thing."

"What's that?"

"I wish that piper'd come back. If only for a second."

"Why?"

"I forgot to thank him for the entertainment."

V.

Al walked into Phil's office and banged the door shut. Phil, who had been leaning back in his chair and staring out the window, turned. He smiled when he saw Al. "Hey, there, Alfie. Pull up a chair. The sky's beautiful this evening."

Al slipped between the desks and, with a grunt, fell into the chair beside Phil. He leaned back and stared at the sunset.

"Ain't it something, Al? Makes me wish I'd been a painter."

"Is that before or after you take up the piano?" Al coughed a couple of times, then propped his feet up on a windowsill. He paused a minute before speaking. "All right, Phil, what is it?"

"Oh, I thought you might like to enjoy a little quiet and scenic beauty. Take your mind off work."

"Yeah, I do like—except that every time you give me this 'sit down and relax' routine, it's to soften me up for one of your wild ideas. So throw it at me now and get it over with."

"Shall I break it into bite-size chunks for you, or do you want indigestion all at once?"

"Break it down. My stomach's been giving me trouble, too."

Phil rocked back and forth a couple of times. "That little excursion to the NSA facility was very informative, Al. They showed me around, let me talk to the guards, and tried to make everything appear as a misunderstanding, or a joke."

"Of course, it wasn't either of those," Al grunted.

"Right. Security over there is tight; a misunderstanding would've been cleared up in no time. A practical joker would've been found and disciplined in, at most, four days."

"If their security's that good, how did you . . . " Al broke off. "I don't want to know. So it was a practical joke?"

"Yeah, that's how it appeared: some bored employee dresses up as a TV character to liven things up, a guard mistakes him for an intruder, chases and catches him, the O.D. steps in and the mess is eventually straightened out. But when I talked to the O.D. and the guard, it seemed to me that they weren't telling everything. So I took the guard to someplace quiet and pulled the whole story out of him."

"How much did it cost?"

"Don't worry," Phil said soothingly.

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"It won't be on the expense voucher." He smiled and turned back to the window.

"The story I was given is essentially correct: the guard chased someone dressed in a costume, minus a badge, thinking he was an intruder. However, the intruder wasn't caught."

"I thought as much."

"Ah, but that isn't the half of it: they don't know how he got out. He set off some kind of flare as a distraction, then disappeared. A full scale search of the building turned up nothing, and the perimeter guards saw no one enter or leave around that time period."

"Did anyone else see this 'intruder'?" Al asked.

"No. But the doors to one of the offices and the lab inside were unlocked . . . and the office and lab had been secured and the keys turned in about thirty minutes before. There were also papers laid out and equipment moved that suggested someone had been looking around."

Al pondered that. "All right. And?"

Phil inhaled deeply, and talked slowly. "Either we've run across one fantastic quick-change and escape artist, or . . . " he paused, glanced at his friend, "or my 'terrorists' are stepping up their operations sooner than I expected. I think a visit to some classified installations around the country is in order."

"Why? There's only the one incident in this area."

"That's the only one we know. If there are others, and they're as embarrassing as this one, how much chance would they have of being reported?"

"Ummm." Al rubbed his stomach thoughtfully. "And you want to do the legwork?"

"Is anybody else qualified?" Phil replied sarcastically.

"No. But I'll have to put a condition on you." Al didn't look at the agent as he spoke.

Phil sat up. "What?"

"Take one of the younger guys with you. Show him the ropes. That way I can pass it off as a training exercise. It'll keep Simmons and his ass-biting accountants off of my back."

Phil started to interrupt, but backed down at his boss' final statement. He simmered for a minute before speaking. "Okay, Al. Who knows? Maybe I can teach him a thing or two."

Al was in stitches during the first hour of their meeting after Phil's return. "I—wish—I—could've seen—that monkey's face—when they told him—where his car was!" Al gasped out. He tried to catch his breath, but several chuckles escaped first.

Phil nodded. "If that Navy captain hadn't spotted it, I'm sure they'd still be turning the Pentagon inside out looking for it. As it is, Admiral Bender's going to be hearing a lot about his new parking spot on the roof."

That remark brought out another gale of laughter from Al. "And that computer system?" Al choked out between laughs. He stopped long enough to intone, "General Parmenter is a pompous baboon" before breaking out in laughter again. Finally he settled down enough to speak coherently.

"Philski, you've made my day. And my week. I feel almost good enough to

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smile through one of Simmons's briefing sessions."

Phil grinned. "I'm glad. Now comes the bad news."

Al sobered almost completely. "I knew it was too good to be true! Ah, but it felt good . . . damn good. OK, lay it on me."

"These are my conclusions, based on what I've seen," Phil began. "There is a big group, or an organized set of small groups, spread out all over the country. Right now, they're experimenting: practical jokes to avoid alerting us while testing our security and their capabilities. They're well placed, they're organized and they can move men and equipment quickly. They're warming up for something, and I'll bet my pension it isn't a practical joke."

Al chewed on that. "Any idea how much they can move at one time? Men or material?"

"No. But a tank battalion popping out of nowhere wouldn't surprise me."

Al looked silently out of the window for a few minutes. "Seems like we'd know about any big armories collecting out there. No, I'd be looking for rifles, handguns—small stuff that's easily collected and hidden."

"Tanks or guns, we'd need search warrants to find the stuff. They'd be careful about hiding it until they're ready."

"Are you sure it's big? It might be a small splinter group spreading their activities around to fool us."

"If it is, they're traveling back and forth in ICBM's. Here . . . this is a rough list of what happened where and when." Phil handed Al a small notebook. "They'd have to be able to go from coast to coast in fifteen minutes to make those times."

Al studied the notebook for a minute. "Okay, it's a large group. Now, the $64 question: what are they preparing for?"

"Make a guess, Alfie. Whatever it is, I'll bet we won't like it." Phil paused. "Let me give you the $64,000 question: what are we going to do about it?"

"Nothing," Al replied. "Sit on it."

"What? Do nothing? Al, we have to move on this!"

Al looked straight at his friend. "You know we have to move—I know we have to move. But Simple Simmons isn't gonna budge unless I push with a bulldozer. Get me hard evidence, Phil, preferably some dynamite I can use to give him an enema."

"All right—I'll try to get more leads. But can't we recommend increased security procedures, or something?"

"That's all we can do, dammit —recommend," Al snorted. "Maybe they'll go for that . . . I'll put in a memo tomorrow." He sat back and stared out the window again.

Phil studied him. "I know that look, Al. What is it?"

"We're missing something. Something basic. Intruders, missing cars . . . " He looked at Phil. "Communications . . . I remember seeing something about some telephone calls . . . "

Phil thought a moment. "Ye-es, there were a few crank calls, but they didn't fit into the pattern."

"Maybe you'd better do some more checking."

"Al, my grandkids will be grand*parents* by the time I check every crank

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call made to a military base! Have a heart!"

"I didn't mean just telephone calls. Did you try teletype, radio, microwave links—any of those?"

"No . . . I forgot about them." Phil grinned sheepishly. "Any chance I can get some help on this?"

"I'll see what I can do." Al scribbled on a piece of paper, handed it to Phil. "Here's a friend of mine at the FCC. Try him."

Phil glanced at the paper. "Okay. Oh, boy, more leg work. This assignment is giving me more exercise than I've had in years. I just hope we run across something before I have a heart attack and miss out on the ending."

VI.

The mound on top of the upper bunk undulated slowly, as two hands slid out from underneath the blanket and folded it back on itself. The face that appeared grimaced with pain from the combination of sunlight and overhead light flooding the tiny room. The hands started to pull the blankets back over the face when a number of disc-shaped objects landed on top of the blanket and bounced off of the wall beside the bed.

"Ow! Argh! Stop! Stop it, Bernie!" The figure under the blanket sat up abruptly, holding up the blanket for protection. The short, red-headed man, half-squatting on the floor, stood up and yelled, "Rise! Rise to a new day! Rise and shine!"

"All right already! I'm awake, I'm awake! You don't have to bust my eardrums!" Gus moaned, sitting up with the blanket over his head. As he pulled it off, Bernie piped up, "No, no, leave it on! It improves your looks one hundred percent."

Gus glared. "You used that one last week. Karl up yet?"

"Nope. Haven't seen him."

"Good, Gotta use the bathroom." Gus half-slid, half-fell out of the top bunk, narrowly missing a box on the floor. With literally a hop, skip and a jump, he made it out of the tiny dorm room and into the combination closet-bathroom area adjoining. He disappeared quietly into the bathroom. Bernie, meantime, scrambled back and forth packing a score of boxes with books, paper and other things.

Ten minutes later, Gus, completely dressed, slipped past his scurrying friend and out of the room. Thirty minutes after that, he reappeared, rubbing his stomach. "Ah. *Now* I'm awake."

"You speak better when you're asleep."

"Very funny. What goes first?"

Bernie pointed at two boxes next to the lower bunk. Gus tiptoed over, picked them up, stopped to catch his balance, then stomped out of the room. Bernie kept packing and shuffling, even as a dark figure appeared in the closet-bathroom area. The figure watched Bernie for a minute, then turned toward the bathroom.

Gus popped in a few moments later, grabbed another box and popped out again. When he returned, a hiss of steam obliterated his first words; he waited until it died down. "Well, that answers my first question: 'Mr. Spock' is awake. What next?"

"Let's see . . . my bagpipes are al-

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ready packed . . . Is there any room in the back seat?''

''Naw. It's hard enough to see out the back now. Want me to bring the rest?''

''Yes, please. You shouldn't be able to break anything.''

''Oh, gee, in that case, I'll be extra careful.'' Gus put out his hand to lean on Bernie's desk, slipped and barely caught himself before falling on top of Bernie. He scowled as Bernie rolled on the floor, laughing. ''One of these days, I'm going to do something graceful and really scare you,'' he growled.

''Like what? Trip over a ballet dancer?'' Bernie chortled, scrambling out of Gus's reach.

''I don't want to hear about that halfback again!'' Gus yelled, chasing after him. Bernie's answer was cut short as he ran through the closet-bathroom area, through the room beyond, and out the door, followed by Gus.

Half an hour later, they reentered their room, both panting. Gus walked across the room and fell into his chair. ''Okay, you win. Go on, git! I'll bring the rest of it.'' He sighed. ''She must be pretty special. I've never seen you in this much of a hurry before.''

Bernie fell into a half-crouch and flicked an imaginary cigar. ''Wouldn't you like to know. And it ain't the boss' daughter, either.''

Gus looked up, surprised. ''You're kidding.'' He studied Bernie for a moment. ''No, you're not kidding. Same one as last time, or a new one?''

Bernie's grin widened, but he said nothing.

Gus waited another moment, then shrugged. ''Okay, Groucho . . . I can't blame you for wanting to keep her secret. Go on—vamoose!''

''Ah, he said the secret woid.'' Bernie flicked the cigar again and bounded out of the room. Gus sighed, pushed himself to his feet, and saw Karl standing in the doorway to the closet-bathroom area, combing his errant hair into impeccable neatness.

''Well, hullo, I was about to come get you.''

''Morning. Did I hear Bernie depart?''

''That you did, sir. We put most of his junk in his car last night. He decided to put in some more this morning.''

''Why was he in such a hurry?''

''He has a rare extracurricular activity lined up,'' Gus said, his hands tracing feminine curves in the air.

''Oh. New one?'' Karl asked.

''I don't know. He wouldn't say.'' Gus turned toward some left-over boxes. ''Would you help me with the small stuff? We couldn't get everything into his car.''

''Okay. By the way, why are we moving? I thought we were okay for another quarter.''

''Oh, we are, we are. Ahh—umm. Well . . . '' Gus turned pink. ''Ummm . . . I had a slight accident with the transporter.''

Karl stopped in mid-stroke to stare. ''What happened?''

''Uh . . . ummm . . . you know how we'd been talking about maintaining the stasis for more than a few microseconds? Well, I . . . do you remember that blackout we had a few weeks ago?''

Karl started to nod, stopped in mid-nod, and stared; his mouth moved but no sounds emerged. Gus just nodded.

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Karl laughed and coughed, paused to get his breath back. "Anything burn out?"

"Not on our rig; the safety cut out in time. I think I wiped out every CB and radio in the city, though. Are you all right?"

"Just let me catch my breath." Karl sat down and breathed deeply a couple of times. "I think I'm beginning to understand why you wanted some outside help. It really did all that?"

"Yeah, it sure did. Uh . . . let's move this stuff before anything else happens, okay?"

"Sure, sure. It's a good thing neither Bernie nor I plays football . . . " He broke off suddenly to duck a well-aimed pillow.

Some time later, the two men stood in the empty closet-bathroom area. "I hope that's everything," Gus said.

"Should be—wait a minute. Did you check Bernie's secret hiding place?"

"I watched while he emptied it." Gus twisted slowly around, checking the space with his eyes. "I hate leaving like this. It's such a pain to move everything out and then back again." He paused. "We need someplace larger so we can store our junk."

"Why don't we get an apartment?"

"An apartment? Gee, I dunno . . . "

"We can get twice as much space as we have here. And it'll be a nice hideout if we have another 'accident' . . . or something more serious happens."

"Hmmm. I'm still not sure . . . " Gus held his chin in one hand while studying the floor. "Can we afford it?"

"Sure we can. There isn't that much difference between the dorm rent we're paying now and apartment rates around here."

"Hmmm. In that case . . . hold it—what'll we tell our parents?"

"Do we have to tell them anything besides the fact that we're moving into an apartment?"

"No, I suppose not." Gus paused. "There is one very important question, though."

"What's that?"

"Can we order more pepperoni pizza?"

Karl cracked up. "Yeah!" he gasped out. "We'll call from the Pentagon this time!"

It took them a long time to calm down. Gus glanced at his watch and sobered quickly. "Hey! It's getting late. We'd better get going."

"How about checkout—"

"Already taken care of. Go on! I'll be right behind you." Gus turned his back to Karl, twisted his head around to speak over his shoulder. "Tell Bernie about your apartment idea. We can discuss it when we get back together."

Karl showed Gus a circled thumb and forefinger. He pressed a button twice on what looked like a transistor radio he held in his other hand, then slipped the radio into a pocket and stood rigidly still. When the light intensity returned to normal, the space was empty.

Gus looked once more around his dorm room, and walked slowly back to the closet-bathroom area. "I wish I could think of something that would top those guys. . . . " he thought aloud, pulling out his own transistor radio. "Waitaminute—ye-ss . . . "

The dorm room's front door opened just as the light disappeared.

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VII.

A special government facility between Baltimore, MD and Washington, D.C.—

The extra guard detail arrived at their duty stations just before the tidal wave of early shift workers hit the checkout stalls. They knew, either through experience or classroom instruction, how to handle quitting time chaos generated by human and automobile traffic. They did not know, however, how to deal with chaos generated by other entities entering the picture.

In the parking lot, cars zigged and zagged underneath lights that appeared to be erupting sparks or gushing rainbows. Building fence lights crackled, car horns blared and security guards ran frantically back and forth. A few cars sped recklessly toward the main exit, while the rest crawled, trying their best to get away.

One new model car, bucking and jerking, made its way along. Its headlights, when they were on, played with an apparent wall of sparks at the edge of the parking lot. The car crawled along, getting closer and closer to the barrier, when suddenly the engine roared and it plowed into the wall.

There was no physical resistance: the engine died momentarily, then roared into life and the car disappeared. The other cars stopped and a dozen drivers stuck their heads out of car windows, waiting and watching.

Fifteen minutes later, somebody yelled, "He's all right! He got through!" and three dozen cars simultaneously tried to go through the same spot. More vehicles rammed into the pile until a security guard carrying a portable bullhorn screamed at them.

"Don't panic! There's no cause for alarm!" the loudspeaker rang. "There's no cause for alarm! The problem in the wiring has been found and is being fixed. Repeat, the short is being fixed. All essential personnel report back to their duty stations. Nonessential personnel please do not try to leave the grounds. . . . "

The message was repeated three times and had begun a fourth when the lightshow evaporated. More cars rammed into each other as their drivers overcompensated. It took an hour and a half before traffic moved again, but when it did, the parking lot and adjoining roads emptied with such alacrity that not a few guards questioned whether there had been a traffic jam at all.

VIII.

Simmons listened attentively while Phil outlined his investigation and theory. Al tried not to grimace as his eyes took in the fine carpeting, the polished wooden desk and the framed certificates on the walls.

Simmons nodded as if he understood everything Phil said. Phil started into a line of gibberish once, but a sharp look from Al cut him off. He finished his report and waited for a reply.

Simmons's smile came too quickly and too easily. "That's all very interesting. Why didn't you come to me with this before?"

"I wanted something solid to back up my hunch. Until now, that's all it was."

Simmons smiled and nodded, but his eyes were somewhere else. He returned

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a few moments later. "Well, I'll put this through channels. I don't expect much to come of it, but I'd like for you to keep going on this 'hunch' of yours. Maybe something else will turn up and we can present it to the director."

Phil started to speak, but Al cut him off with an "okay—will do," and pulled Phil out of the office. Phil stayed quiet until they were well down the hallway.

"Dammit, Al, what does that—" He quieted at a warning gesture from his friend. Al waited until they were secure behind doors before he let out an immense horse laugh.

"Would you mind letting me in on the joke, Al?"

Al quieted down to a chuckle. "I almost swore Simmons was going to kowtow at your feet, Phil. You couldn't've gotten a better response out of him even if you had plunked down the names and locations of the bastards who pulled off this last stunt!"

Phil frowned. "I don't follow you."

Al sighed. "Philski, old buddy, I really wish you'd learned more about office politics. You show those sons of bitches how desperate you are to keep this job and they'll hang you out to dry. Simmons is going to put this thing through channels, all right, and he's going to lick every boot he can, following it. It'll make him look good in front of the top brass, and if we handle it right, we can get up there on the pedestal with him."

"What's wrong with demanding to see the director and telling him what's going on? We have to get moving on this, Al, before something else happens."

"You do that and you'll have everybody between me and the director reaching for your throat. No, office politics says we have to make everyone up the ladder look good, and get them on our side. It'll take a while, but we—" He was interrupted by the phone. He answered it, then handed it to Phil. "For you."

Phil took it. "Branch speaking." He listened for a few moments, then said, "Hold on a minute." He turned to Al. "It's your friend from the FCC. I asked him to look up anything unusual happening among the airwaves over the past year. He found something. I think you'd better listen."

Al rolled over to another phone and picked it up. They listened for a few minutes; suddenly, both men looked at each other in surprise. After a few more minutes, Phil said, "Frank, you've helped more than you can imagine. Can you send me a copy of that report? Thanks. Thank you *very* much." He hung up gently.

Al stared into space. Phil waited. When Al returned, he looked at Phil and said, "Are you thinking what I'm thinking?"

"An accident? Someone moved before they were supposed to?"

"Yeah. In case you can't see it, I've got my fingers and toes crossed." He wiped his brow with the back of his hand. "I suppose you'll want to go down to Atlanta."

"Any problem with that?"

Al shook his head. "I'd just like to know where you're going to start; Atlanta's a big city."

Phil smiled. "I have an idea, Alfie. A little oddball, but if it works, it'll save a lot of time."

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"Will I have to cover for you?" Al frowned.

"No, Al, it's legitimate. Want me to bring you a souvenir?"

Al snorted.

IX.

Phil stood in front of the first floor apartment door and knocked again. The door suddenly opened halfway, with a tall, thin and very young man holding it. "Yes?" the man asked.

"Hello," Phil said, smiling. "Does a Gus Stevens live here?"

"Yes, that's me," the man answered.

"Ah, Mr. Stevens, my name is Phil Branch. I wonder if I could talk with you privately? It'll take only a few minutes." As he spoke, Phil smoothly pulled out his FBI identification and held it in plain view. The young man glanced at it, did a double-take, and leaned forward to read it. When he finished, he straightened and stared at Phil blankly for a moment.

Phil took a step forward but Gus motioned him to stop. "Wait just a second," Gus said, and closed the door. Phil heard something heavy being moved, a door open and close, footsteps . . . then silence. He waited what he thought was an appropriate time before raising his hand to knock again.

Abruptly the door opened wide. Gus motioned him in. "Sorry to keep you waiting. Had to move some stuff—"

Phil ignored the patter as he studied the living room: modestly furnished, with second-hand furniture. A waist-high bar separated it from the kitchen, which was next to the rear of the apartment. The door connecting the kitchen with the outside was locked and bolted. Assorted textbooks and notebooks were strewn about on the furniture and the floor.

Phil turned when Gus's voice stopped. "Excuse me, I didn't catch that last part."

"I said, would you like to sit down?" Gus waved at the sofa. "Just shove the books over if you need more room."

Phil walked to the sofa and sat down. Gus strode over to the bar and perched on one of the stools in front of it. "What can I do you for—er, do for you?" Gus asked.

"I'm looking into something that happened about three months ago," Phil began smoothly, amiable. "Someone put out a radio broadcast that burned out almost every receiver in this area. Do you remember it?"

Gus paled. "Uh, yeah, I think I do. I think I was in—in class when it h-happened. What about it?"

"We tracked it down to one of the dorms over on campus. I've been talking to the students who were living there at the time. Did you notice anything unusual happening right after that, or during that incident?"

Gus paused a moment to consider. "Uh—um—no, I don't believe so. I was so busy taking notes I didn't notice much."

"How about unusual electronic equipment in the dormitory?"

Gus grinned. "There are so many different kinds of stereos out nowadays, I wouldn't know if a system was one or not. Bernie's setup looks more like a radar set than a stereo."

"Bernie?"

"One of my roommates. He and I and one other guy live here."

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"I'd like to talk to them, too. Are they here?"

"Um—ah—not at the moment." Gus glanced at the front door. Phil did, too, and saw an entrance to a hallway he hadn't noticed before. He turned his gaze back to the student.

Gus grinned at him, then looked away. "Uh . . . can I get you something to drink? I'm kinda thirsty."

"No . . . no, thank you."

Gus slid off the stool and walked stiffly into the kitchen. He tried to act nonchalant, but the glass rattled on the counter as he set it down. He poured a fruit drink, filling the glass halfway, then walked stiffly back into the living room. "Do you have any more questions?" he asked, raising the glass.

"No, they've all been answered. But I do have a request. Would you make this easy for me and turn yourself in?"

Gus jumped, choking and spilling the drink mostly over himself. He swallowed and made a couple of ineffective wipes at his pants. "D-Did you just say what I think you just said? You think I-I'm connected with this—this—" he sputtered.

"I don't think—I know you're involved in this incident," Phil told him. "I believe you and your two friends are involved. You can cooperate with me now, and I'll put in a good word for you. Or, you can hold out, and . . . " Phil let the statement hang.

Gus stared at Phil; Phil stared back. A full minute passed before Gus turned his eyes away and sat down. "How did you know?"

"Your broadcast affected more than just radios—fluorescent lights all over the campus flickered in some very interesting ways. You were the only one I've talked to who didn't notice.

"You're right about the variety of stereo equipment that's available nowadays. But you're one of two or three students who didn't show yours off—at least, not to the other students.

"The final proof was the way you responded to my questions. Do yourself a favor," Phil said gently. "Stick to engineering. You can't act worth a damn."

Gus raised his head sharply and stared hard; the agent stared back. Gus dropped his eyes and breathed a deep sigh; then he started chuckling. Soon, he wrapped his arms around himself as if trying to hold back the hysterical laughter that erupted from him. The laughing fit ended shortly after, and Gus wiped at the tear-filled eyes he again turned on the FBI agent.

"Oh-h-h-o-o-o . . . if only you knew how much I'd worried about this happening: jumping at phone calls, glancing over my shoulder—I was a nervous wreck! Now, though . . . " He breathed a deep sigh of relief. "What happens now? Do a bunch of dark-suited men raid this place? Or do you slap the handcuffs on and escort me out to the big black car outside?"

"I often watch the TV shows so I'll know what *not* to do when I'm after suspects. It's amazing how much easier that makes my job," Phil said, grinning. "No, I thought we'd just sit and talk for a little while. Hate to ruin your melodrama, but there are some loose ends I need to tie up for my report."

"Sure. Go ahead."

"That broadcast—was that an accident, or your objective?"

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"That was an accident," Gus chuckled. "I was experimenting with maintaining the—it was an experiment. I had no idea those side effects would occur. I've been a lot more careful since."

"What was your assignment then?"

Gus shrugged. "Assignment? The transporter isn't a class project, it's a hobby. Would that we could get credit for it—"

"No, I mean your group's objective."

"We don't have one—at least, not yet. We do pretty much whatever we think is fun."

"You're independent? Are the other groups run the same way?"

Gus frowned. "Other groups? You mean others are pulling stunts like we are?"

"Several," Phil said. "Didn't your leaders let you in on the overall plan?"

Gus shook his head. "We don't have a leader. We usually talk over any ideas we have for practical jokes, then one of us does it while the others keep an eye on him." Gus rubbed his chin with one hand. "If there are others, why haven't we detected them . . . ?"

"How many of you are in this group?"

"What?—oh, uh, three. Karl, Bernie and myself."

"Where are they now?"

Gus shrugged. "I'm not sure. But they should be back soon." He paused a moment, thinking. "What sort of stunts are these other guys pulling and where?"

Phil hesitated. "Most of that information is classified. But I can give you generalities: in one place, some signal flags were stolen, and replaced with women's pantyhose, and—"

"On that same ship, was the ship's supply of toilet paper converted to money?" Gus interrupted.

Phil caught himself before the surprise showed on his face. "Yes . . . how did you know?"

"I'll explain in a few minutes. First, though, let's check some more incidents. Suppose you give me an outline, and I'll fill in the details. Okay?"

Phil nodded, and related bits and pieces of those incidents he could recall. For every one he threw out, Gus filled in the specifics of what had occurred and where, correcting the vague or incorrect details Phil deliberately planted. After describing the last incident Phil knew about, Gus leaned forward on the stool, his right elbow resting on his knee and his right hand cradling his chin. "Is that all?" he asked.

"All that I know. Are there more?"

"A few . . . very minor." Gus's gaze swung toward the picture window beside the front door. "Interesting. Very interesting."

Phil didn't like the sound of that. "How did you know about these other stunts? You said you were isolated from the others."

"Simple," Gus answered, his head swinging back to the FBI agent. "We pulled those stunts. There isn't anybody else."

A deep silence filled the room while Phil tried to digest the last two statements. They wouldn't stay down. "If it's not too much trouble, could you tell me how you managed it?"

Gus smiled. "Not at all. I've made a discovery—a breakthrough—in physics. Bernie and Karl have helped me refine it. With it, we can do things that

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most physicists will tell you are quite impossible: for instance, causing one object to be in two different places at the same time. Some people describe it as 'folding space,' but that isn't it at all. Anyway, that's how we could seemingly be in two places at once."

Phil thought about what he'd just heard, and decided it was a good idea to humor the young man for now; professional help could come later. "If anyone had made such a momentous discovery, I would have heard about it."

Gus cocked an eyebrow at him and grinned lopsidedly. "Care to bet? Do you know how much attention is paid to an *under*graduate's claim that he's found an error in Einstein's formulation of General Relativity? An *engineering* undergraduate? The only thing they didn't do was kick me out on my ass!"

"I take it no one would listen," Phil remarked dryly.

"Oh, no, there were some who did; more than I thought possible. But the nicest response I got from any of them was his giving me four gigantic textbooks and telling me that after I'd worked through them, I'd see why my idea was impossible!" Gus took a couple of deep breaths; his face was flushed. "I was ready to—excuse me. Sometimes I take it too personally."

"I think I understand." Phil paused. Something about the situation wasn't adding up: either the boy was acting, spinning out this yarn to cover for his friends, or else he was an unbalanced egotist who honestly believed what he was saying. But why trust him with —Suddenly, it made sense: a diversion. A plant to throw him off the trail, while going for cover. Phil decided to change his approach.

"Why don't you throw in with us? You've proved your concept works. Not only can you force those idiots to listen to you now, but you'll get all the funding and help you'll ever need. You can laugh at them all the way to the bank."

Gus stopped himself just as he was about to speak. He studied Phil's amiable face closely. "When you say 'us,' who exactly do you mean?"

"I can only speak for the Bureau—the FBI," Phil said smoothly. "But with a breakthrough like that, I'm sure you'd have no trouble getting the Defense Department interested. Then you could kick ass instead of having yours kicked."

"Uh-huh. Sure," Gus nodded. "In other words, I could kick the asses of a few professors, providing I present mine to be kicked by some high ranking military official. No thanks."

"No—not at all. It's your discovery; you're the only expert. If they start kicking you around, you quit and they'll—"

"—find some way to silence me," Gus finished. "Mr.—uh, Mr.—excuse me, what's your name again?"

"Branch. Call me Phil."

Gus nodded and sat up straight. "Mr. Branch, do you remember what happened to Dr. Oppenheimer, the father of the A-bomb?" Phil nodded. "Can you guarantee that something similar won't happen to me or my friends once the military gets wind of our development?"

Phil considered his answer carefully. "No."

"Thank you," Gus said. "If you'd said anything else, I'd've asked you to leave. Now, can you give a good reason

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why we should turn it over to the government? I can think of a dozen for why we shouldn't." Gus folded his arms over his chest and waited.

"National security is one," Phil stated, crossing his arms over his chest. "How long will it be before someone behind the Iron Curtain makes the same breakthrough? They'll waste no time deploying it, and we'll be caught with our pants down because you decided that your chosen leaders couldn't handle it."

Gus grinned. "That's good. But how can you guarantee that the secret will stay with our side? If it isn't leaked, the Russians will find out we have it and develop their own; they may be lagging in some areas, but they aren't stupid. That's what happened with the A-bomb and the H-bomb."

"How do you know they haven't?" Phil asked casually.

"Huh?" Gus moved quickly to keep from falling off of the stool. "We would've known. There are side effects inherent in the process that can't be masked. We'd know it if someone else was operating one," he replied quickly, uneasily.

"Oh? Are you so sure they can't be hidden, or avoided? As you said, they aren't stupid."

"No, we aren't that sure!" Gus almost yelled. With an effort, he calmed himself. He took a deep breath. "Look, ask any physicist or research engineer—they can tell you that it isn't one hundred percent guaranteed that a TV set or portable radio can work, even though people are using them all over the country. You'll just have to take my word for it." He paused. "I see what you're trying to do; don't try it again, okay?"

"No, I won't," Phil stated. "But see how easily I was able to get information: you've told me about your discovery and part of what it is. By goading you, I now know that it can be detected, and therefore, its operation located. I see from this apartment and from your former dorm room that the apparatus doesn't occupy a lot of space, and doesn't have any special power requirements. Yet from talking to some of your fellow students, I know it sports a sophisticated control mechanism that isn't easily hidden. See? My technical background is limited, yet I found out quite a bit. Now, if someone who had extensive technical training went after you, how long do you think your secret would stay secret?"

Phil let that sink in while studying Gus's reaction. Nothing showed on the younger man's face, but his eyes blazed. Phil waited a few minutes more, letting the confusion take its course in Gus's mind.

"I've been in this business for over thirty years," he said gently. "I've seen kids, teenagers—who've stood for causes both noble and ignoble. I've felt pride, because they were willing to give their all for something they believed in, and felt pity because they would rather waste their lives in jail or die before accepting a word of advice or a handshake from the 'enemy,' no matter how freely it was offered. I'm offering my hand now, Gus. I'm not saying the U.S. government is perfect, or even forgiving. I am saying there are some of us who are working in yours, and the public's, best

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interests. Will you accept my hand? Come help me before this goes too far?"

Gus stared hard at the agent; Phil stared back. After a few moments, Gus dropped his gaze. Phil didn't move.

"What is it you want me to do?" Gus asked.

"Take me to your friends. Let me talk to them—find out if one of them is using you. Help me stop him or them before anyone gets seriously hurt."

"But what about my discovery? Our work?"

"I'll see to it that you talk to the right people about it. But first, let's stop the others before someone gets killed."

Gus searched the agent's face a long time. Phil kept his expression open and friendly, with just a touch of sadness.

"You don't believe a word I've said," Gus said accusingly. "My discovery—our work—it's all just some fantasy or dream or some product of an overworked imagination from a nobody trying to make himself look important. That's what you think, isn't it?"

Caught by surprise, Phil didn't move a muscle.

"Yeah, that's what you think, all right," Gus continued. "To you, I'm an overgrown teenager with delusions of grandeur." He moved off the stool, turned his back to his guest and took a step toward the kitchen. Then he spun around to face Phil.

"Mr. Branch, I've heard what you said . . . really, I have. Now, you'll do me the courtesy of listening.

"I'm an engineer. I like what I do—it's fun, it's rewarding, it makes me feel like I'm worthwhile, that I can make an important difference in this world. My friends and I have made a monumental discovery—I think so, whether you believe me or not. We—or at least, I—have been taught that we're supposed to use our knowledge to help mankind. Turning our discovery over to people who think it's another kind of weapon won't help anybody."

Phil shook his head sadly. "And you still believe you're the best judge of whether or not mankind is ready for your discovery? The next logical step is for you to decide who's best capable of using any scientific knowledge, and then keep it out of the hands of those who can't. The Politburo has been following that principle for years."

Gus stared at Phil indignantly; Phil went on. "I'm sure your intentions are good, Gus. But even the best of intentions can go astray, particularly when a small number of people is involved. The smaller the group, the worse it is." Noting Gus's expression didn't change but his gaze dropped, Phil let him think.

After several minutes of silence, Gus turned away slightly and spoke. "Mr. Branch, were you involved in Watergate?"

"Not personally, no."

"Before the scandal broke, these men were among the top most trusted officials of our government. If you had access to a device that would let you see and hear inside any private room, any sealed enclosure in the world, would you turn it over to your superiors? Knowing its potential for abuse?

"I wouldn't—unless I could trust them. Unless I knew and I felt, that—that I could guarantee that they would not use my creation to harm another living being."

Phil sighed inwardly. He'd almost

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won—but in this case, almost wasn't good enough. Time to get back on the trail and find a new lead. Still, his intuition told him to make one last try; he might salvage something, even if he wasn't sure what.

"I hope you aren't going to insult my intelligence with an appeal to my patriotic duty," Gus said sourly.

"No," Phil answered, changing his position on the sofa. "But maybe I can appeal to your sense of humor." Gus frowned. "What comes after the practical jokes? What is the next step?"

Gus shrugged. "We haven't really decided. Developing the equipment and studying has been taking up most of our time."

"Suppose I suggest that you keep on with your practical jokes . . . but under proper supervision."

"And who would supervise us?"

"I would."

"In which case, we'd become an extention of the FBI. No, thank you, we don't need—"

"Wait," Phil held up a hand in supplication. "Hear me out first. Maybe supervise was the wrong word—I'd be a consultant. With my experience and contacts, I could tell you the best places to drop in on, the best stunts to pull. You don't have to do anything you feel would be wrong. All I ask in return is that you listen to what I say, and perform one or two special favors."

Gus's eyes narrowed suspiciously. "Why would you do this?"

"I'm being retired from the Bureau. They believe that because I'm a certain age, I can't cut the mustard anymore. If you take my offer, I can stay active and have my revenge on those fools, both at the same time."

Gus was silent a moment. "What's to keep you from turning us in, if we agree? Use us as a grand finale before retiring?"

Phil shrugged. "I guess you'll have to trust me." He reached into his coat and pulled out a small box. He offered it to Gus.

Gus examined it. "A tape recorder?" he asked.

"Yep," Phil answered. "The only evidence we have on you."

Gus grinned. "Can you play what's on there?"

"Yes," Phil replied, puzzled.

"Please do so now."

Phil pressed a button, paused, then pressed another button. He could just make out two voices amidst the noise coming out of the tiny speaker, but neither one sounded like Gus.

Phil turned the unit off. "I see. My offer still stands." He pulled a piece of paper out of his pocket and scribbled on it. "This is my phone number and home address. You can contact me when you're ready." He handed the paper to Gus and stood up.

Gus motioned him to sit down. "Wait a minute, please. I have to talk this over with the others." He walked to the front door and made a sharp turn into the hallway behind it.

Phil fidgeted. This was much better than he expected, but the situation still made him uneasy. Besides, he was anxious to call Al to start working on a possible leak.

Gus popped into the living room five minutes later. "The guys are curious about your offer. Care to meet them?"

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Phil nodded, rose and followed Gus down the short hallway. They stopped at what should have been the bedroom door. "Wait here. Don't enter until I tell you to, okay?"

Phil agreed. Gus slipped around the door, too fast for Phil to peek in. A few moments later the door opened wide. Gus stood near the entrance, leaning on some sort of control panel. Behind him the room looked like part laboratory, part junkyard.

"Mr. Branch, here are Bernie and Karl." Gus waved to each in turn. Bernie's red head snapped around to give a quick nod and then back to the computer console he was working at. Karl stepped away from the bench where he was working and made a slight bow.

Phil almost stepped into the room when Gus held up a hand. "I'm sorry if this seems rude, but we don't want to risk injuring you in the experiment we're running. Please stay where you are.

"I like your proposition, but we have to talk some more about it. We'll be getting back in touch with you, fairly soon, I hope, Mr. Branch. It's been a pleasure talking to you."

Gus's thumb rammed down on a button. Phil charged forward——into an empty room.

He ran into the far wall and rebounded, barely keeping his balance. After waiting a few minutes to regain his poise, he searched the room thoroughly. It was completely empty.

He wandered back into the living room, beginning to doubt his own senses. The books and notebooks were still there. So was the glass on the bar. He sat down hard on the sofa.

A piece of paper floated down and landed at his feet. He ignored it at first, until he saw printing on it. He picked it up. It read: PLEASE TURN OFF THE LIGHTS AND LOCK THE DOOR WHEN YOU LEAVE. THANKS.

Phil stared at it. His face was blank for a few minutes. Then he started laughing out loud.

X.

Phil pulled open a lower drawer of his desk just as Al burst through the door. "Phil, are you out of your goddamn mind? This report's going to get us both executed!"

Phil lifted some papers from the drawer and packed them in a box on his desk. "Yep."

"Yes, what!"

"Yep to both statements." He packed a few more papers before looking at Al. "I'd suggest you get your professional ass out while you can, Alfie."

"Phil . . . what has gotten into you?" Al leaned on the edge of the desk opposite the other man's. "You've been acting damn funny ever since you got back."

Phil stopped packing. "Funny how?"

"For one thing, you've been smiling more."

Phil smiled. "Maybe I've found something to smile about."

Al frowned. "The only other time I've seen you smile like this was when you talked about retiring."

"Yep." A notebook fell into the box.

"You aren't serious."

"Yep. Very serious."

Al stared, silent for a minute. "What am I going to do without my best agent?"

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Phil shrugged. "Find some new ones?"

"Phil!"

Phil stopped, rocked back in his chair and looked Al in the eyes. "Al, I've spent most of my life trying to make sure that my kids have a decent place to live and grow up in. I've put so much time and energy into that that I've forgotten who they were. I think it's time for me to go back and see if they'll forgive me and let me get to known them. And my grandchildren."

Al searched Phil's face. "You found something."

"Yep."

"It's not in your report."

"For a good reason."

Al waited. Phil looked at him, then resumed packing. "No one would believe me."

"I would," Al pleaded.

"Yes, you might. But I kind of hope you wouldn't."

Al kept looking at Phil. "You know, of course, that Simmons will have our hides if I give him your report as it stands."

"My hide's already spoken for; yours is tough. You'll survive, Al. I have faith in you."

Al stared. Slowly he turned to leave. At the door he turned back. "You don't mind if I look for it, do you, Philski?"

"Nope." He started to close the box. "Hope you find it, Al. Do you a world of good."

Al stared puzzledly at his friend. Then, shaking his head, he turned and left.

Phil just smiled. ■

01, 10, 11, 100

In Binary language, 00 is none,
Which cannot be said to be new.
Nor is it novel that 01 is one,
But in Binary, 10 is two!

If you ponder and strive, perhaps you'll contrive
A matrix from which you will see
That 101 stands for the numeral five,
While the simple 11 equals three.

Computers of course speak Binary perforce,
Though we mortals the language abhor;
We'd sooner endorse the numerical Morse
But we're not who the language is 100.

Francis Cartier

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The Alternate View

PARADOXES AND FTL COMMUNICATION

John G. Cramer

Achilles, a vigorous young sprinter, is to race with a tortoise. As it happens, Achilles can run precisely twice as fast as the tortoise, so in fairness to his opponent he gives the tortoise a head start of exactly half the distance from the start to the finish line. At the starting signal the race begins, and Achilles runs to the starting position of the tortoise. In the time this takes him, the tortoise has advanced half the distance from where he started to the finish line. Next Achilles advances to the new position of the tortoise, and the tortoise again advances half the distance to the finish line. And so on . . .

Every time Achilles moves to where the tortoise had been, the tortoise moves ahead by half that distance. It requires an infinite sequence of such steps to reach the finish line, and at every step the tortoise is ahead of Achilles. Never in this infinity of steps is Achilles able to catch the tortoise. So Achilles, despite his greater speed, is unable to catch and pass his slower opponent. In the more general case, it is demonstrated to be mathematically impossible for a fast runner to overtake a slow runner. Right? Are you convinced?

This description is an example of a physical paradox, a swindle that leads along a chain of plausible physical or logical arguments to a surprising and perhaps incorrect conclusion. This particular paradox was invented by Zeno, a philosopher who lived on the island of Elea during the Golden Age of Greece over two thousand years ago. Zeno's conclusion, of course, is absurd. Given enough time it is clear that a fast runner can always catch and pass a slower runner. Yet Zeno's arguments are logical, aren't they?

The flaw in Zeno's logic lies in the way he treats infinities. He implies that an infinite number of progressively decreasing time steps will sum to an infinite time interval. This is false. In Achilles's race the infinite sum of infinitesimal time steps adds up to a definite and fairly short time interval. Achilles will catch and pass the tortoise at the finish line, just as common sense would suggest.

Zeno's paradox points to a problem in the mathematical thinking of the classical Greeks. They had a well-developed geometry and mathematics, but they lacked a well-developed concept of infinitesimals, the foundation of integral and differential calculus. It is plausible that if the mathematical thinkers of the time had taken Zeno's paradox seriously and devoted the proper thought to its analysis and resolution, they might have been led to invent differential and integral calculus a millennium before its actual formulation by Newton and Leibnitz. That would undoubtedly have altered the progress of science and might also have changed the course of history.

Paradoxes like this one occupy a very

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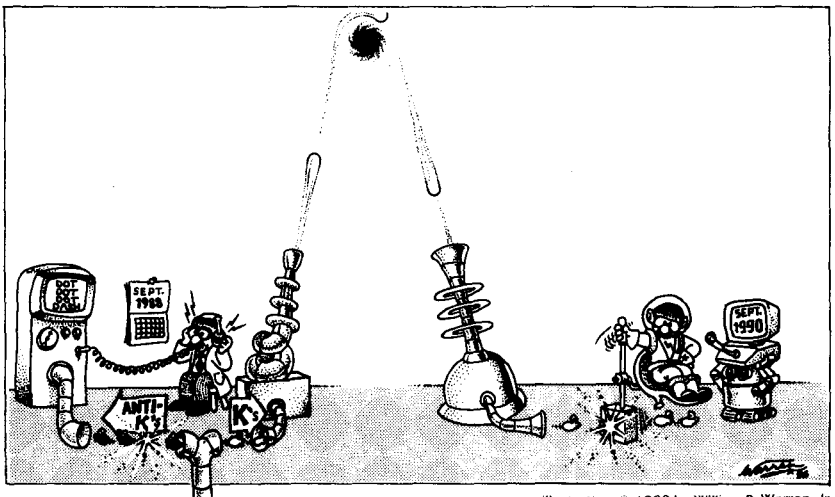

Illustration © 1988 by William R. Warren, Jr.

special place in the history of science. With the clear vision of hindsight we see situations, like that of Zeno, when the resolution of a paradox might have led to an intellectual breakthrough, but the paradox remained unresolved and the opportunity was wasted. There have also been occasions when the resolution of a paradox produced an important scientific breakthrough by leading to a new way of thinking about the universe.

Consider the case of Galileo. He was puzzled by the way Aristotle, a couple of millennia earlier, had described falling bodies. Aristotle said that a heavy body falls faster than a lighter body. A feather, for example, falls more slowly than a gold coin. But Galileo considered the following paradox. Suppose we drop two identical gold coins which, according to Aristotle, fall at the same rate because they are equally heavy. But now suppose that the coins are connected by a very light thread. According to Aristotle this should make them fall faster because they have become a single object that is twice as heavy. But why? What does the thread *do* to make the coins fall faster? Since the coins are falling at the same rate when unconnected, neither can pull on the other through the thread to increase the fall rate.

Galileo considered this paradox and concluded that Aristotle was wrong. In the absence of air resistance (which slows the feather more than the coin) all bodies must fall the same, whether they are heavy or light. Galileo's analysis proved to be the foundation stone of modern dynamics. He made the conceptual breakthrough that made it possible for Isaac Newton, some decades later, to discover the laws of motion.

Or consider Olbers's paradox. Heinrich Olbers, a German astronomer of the 1700s, wondered why the sky is dark at night. That's a stupid question, right? The night sky is dark because the sun is down. But examine Olbers's argu-

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ment. At increasing distances from the Earth there are increasing numbers of stars, which exactly compensates for the decrease in the light intensity of each star due to the inverse square law. Starlight from any distance contributes the same amount of light-energy as from any other distance. The universe is very large, so the night sky should be very bright with starlight. So bright, in fact, that it would have a temperature of several thousand degrees K, a toaster-oven hot enough to make life on Earth impossible. Yet we are here on the Earth as a living contradiction to Olbers's arguments. How is that possible?

The logic is faulty because Olbers was unaware of a key fact: the universe is expanding. The more distant stars and galaxies don't bathe the Earth with the same intensity of starlight as those nearby because the energy from distant stars and galaxies is reddened and reduced by the Doppler shift as they speed away from us with a velocity that depends on their distance. Edmund Hubble discovered the expansion of the universe in 1929 by studying the Doppler shifts of distant galaxies. But the same conclusion *might* have been reached almost two centuries earlier if astronomers had carefully considered Olbers's paradox and realized its implications.

The history of science teaches us, then, that it is important to analyze and understand paradoxes as they arise. What unresolved paradoxes should be studied today? The principal paradox that falls into this category was developed in 1935 by Albert Einstein in collaboration with Boris Podolsky and Nathan Rosen. It is the famous Einstein-Podolsky-Rosen (or EPR) paradox, which has been the center of a raging debate for five decades.

Einstein distrusted quantum mechanics because he perceived in it what he called "spooky actions at a distance," the enforcement of quantum relationships faster than the speed of light (FTL) across space and time. The EPR paradox was carefully constructed to spotlight this aspect of quantum mechanics. It has led, through the work of John Bell, to recent "EPR experiments" that demonstrate the FTL aspect of quantum mechanics. Correlated optical polarizations of oppositely directed light photons show that something rather like faster-than-light hand-shaking is going on within the formalism of quantum mechanics and in nature itself.

But if you think this opens the door to faster than light communication and travel, think again. Nature's FTL telegraph is not available to us. A common feature of all the EPR experiments is that the effects demonstrated *cannot* be used by one observer to send a FTL message to another observer. Because that would represent a breakdown of either special relativity or the law of causality, such FTL communication is considered by most physicists to be impossible.

Or is it? A few months ago a new version of the EPR paradox was proposed by Datta, Home, and Raychaudhuri (DHR) of the University of Calcutta. Their scheme is sufficiently unusual that we will refer to it as the *Calcutta paradox*, a method of using the peculiarities of neutral K-mesons (kaons) for FTL communication between observers.

The meson is a short-lived denizen

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of the world of particle physics, existing for only a few billionths of a second before decaying into lighter particles. Mesons in the quark model are matter-antimatter combinations of a pair of quarks. I wrote about neutral K mesons (kaons) in another AV column in the September 1986 issue of *Analog*. The K° meson is made of a "down" quark and an "anti-strange" quark. Its anti-matter twin, the anti-K°, is a strange quark and an anti-down quark. Both K°'s have zero electrical charge and spin, and both have the same mass (about half a proton mass). On the basis of all observables they are indistinguishable.

When two quantum states cannot be distinguished, a peculiar thing happens. The two indistinguishable states mix to form two new states of matter that are distinguishable. In the case of neutral kaons, the K° and anti-K° combine in two different ways to make the K_S particle (K-short) which decays in about 10^{-10} seconds and the K_L particle (K-long) which decays 581 times more slowly. The K_L state is unique because it shows what is called "CP violation," a preference for matter over antimatter and for one direction of time over the other. The K_L demonstrates that systems composed of matter and of antimatter do not behave in precisely the same way, and that if a movie were made of particle reactions involving a K_L, one could tell if the film were running forward or backwards through the projector.

The K°'s used in the Calcutta paradox are made in pairs by a resonance that produces a K_L going in one direction and a K_S going in the opposite direction. The calculations presented in the DHR paper indicate that if a detector for anti-K° particles, which interact strongly with nuclei, is placed in one arm of the experiment, it will instantaneously change its counting rate when a copper block is placed in the path of the other kaon, as compared to the counting rate when no copper is in the path. In other words, the DHR experiment would allow an observer with the copper block to telegraph a faster-than-light message to an observer watching the counting rate of the anti-K° detector at the other arm of the experiment. This FTL communication scheme is the Calcutta paradox.

To illustrate the true content of the Calcutta paradox, let us do something more grandiose. First, construct a neutral particle accelerator (I wish I knew how to do that) that can boost the kaons on the copper block side of the experiment up to a kinetic energy a few trillion times greater than the kaon rest mass. After acceleration to such ultra-relativistic speeds the kaon's decay lifetime is stretched from nanoseconds to years by relativistic time dilation. Now send the the kaons out into space to travel for a year, make a 180° turn around a conveniently placed black hole, and return to the laboratory two years after leaving. Finally, decelerate the kaons back to their former velocity and either let them collide with the copper block or allow them to decay in flight.

The FTL communicator has now been transformed into a backwards-in-time communicator. The experimenter positioning the copper block can send a

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message backwards in time to the experimenter watching the anti-K° detector, two years in the past. I will leave it as a problem for the *Analog* reader to figure the SF implications of such a telegraph. Consult the works of Benford, Hogan, and Heinlein if you get stuck.

Could this scheme work? Is it possible that the fantastic implications of the DHR calculations are correct? Probably not. Up to now Nature has covered her tracks pretty well, blocking all possibilities for using the EPR effect for FTL communication. And yet, if there were a loophole in this prohibition, it's very plausible that the kaon's CP violation would be the place where it might appear. The time asymmetry built into the decay of neutral kaons is just the sort of effect that might overcome the time asymmetry of causality, the no-backwards-in-time-communication rule.

The Calcutta paradox is published and will be carefully studied. If it survives the scrutiny of theoretical physicists, it may some day be tested in the laboratory. We'll just have to wait to see if it is a real paradox, or only a flaw in a chain of logic. Either way, we're going to learn something.

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RANDALL GARRETT, 1927-87

Randall Garrett, a prolific and popular contributor to *Astounding/Analog,* especially during the 1950s and '60s, died in his sleep on December 31, 1987, at the Veterans Administration Hospital in Austin, Texas, after a long struggle with encephalitis. Born in Lexington, Missouri, Garrett was educated and worked as an industrial chemist before becoming a full-time writer. Perhaps best known for his "Lord Darcy" series (*Too Many Magicians,* and others), and for the distinctive vein of humor and parody that ran through his work, Garrett was even more prolific than he appeared. His contribution to the field under his own name was impressive, but in addition, he (sometimes alone, sometimes in collaboration with others) also wrote under a long list of pseudonyms, including Robert Randall, Mark Philips, and David Gordon.

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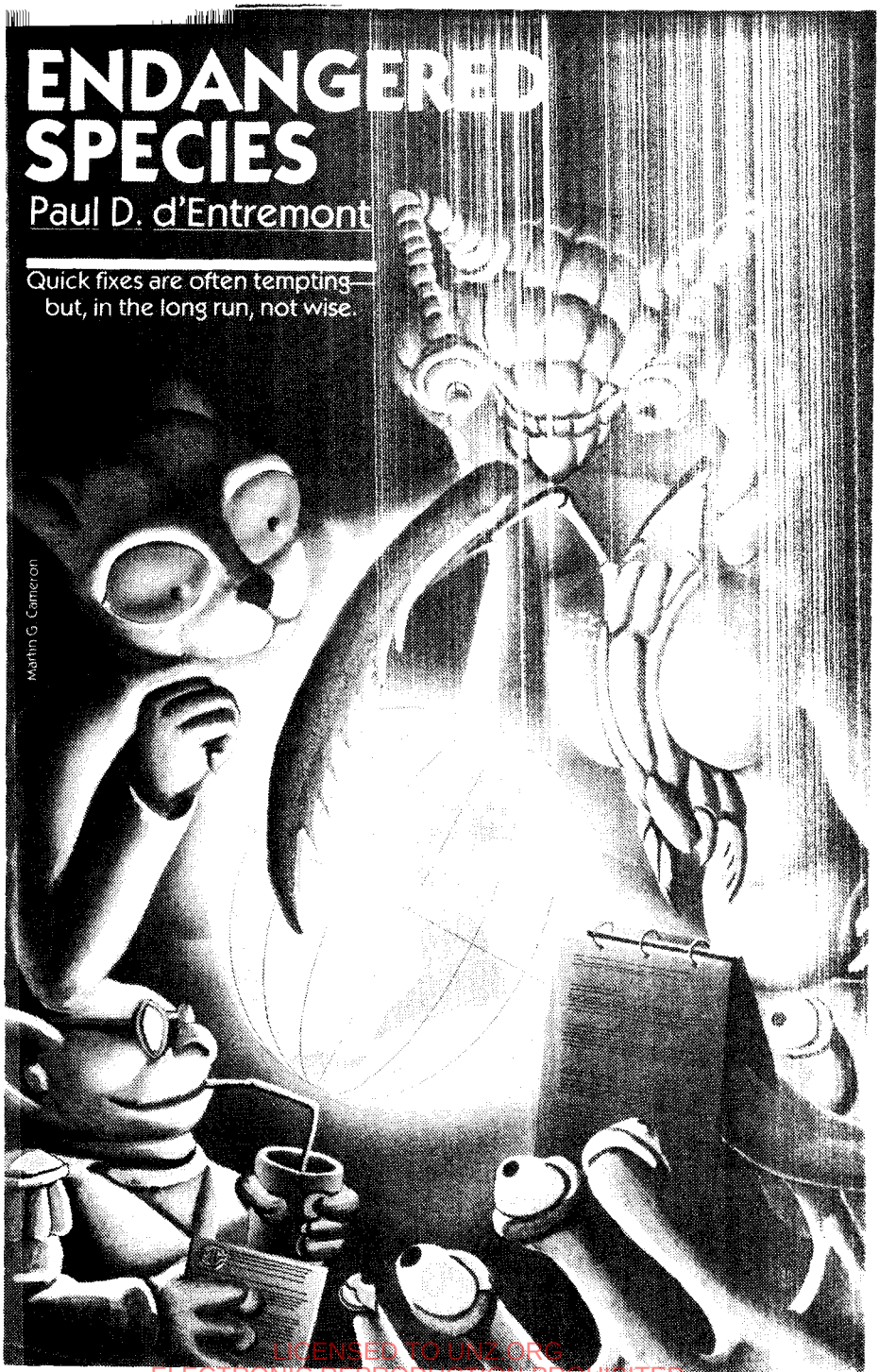
ENDANGERED SPECIES

Paul D. d'Entremont

Quick fixes are often tempting—but, in the long run, not wise.



Martin G. Cameron

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There was a hush in the galactic council chamber as Speaker Matr'sed Kellnea, known as Kellnea the Wise, entered through the vaulted stone door and fully extended his eyestalks. The twenty-eight legs on each side of his body moved in smooth, undulating waves as he glided down the aisle like a stately Benchurian starship. His gray silicon shell was covered by the speaker's ceremonial robe, a Vanasian metallic cloth that reflected the natural blues, reds, and yellows of the chamber's marcite dome.

He smoothly ascended the ramp to the platform and sounded the speaker's claxon.

"The 5077th galactic council is now in session," he said. He paused, waiting for complete silence in the chamber. "The first order of business today is an endangered species proposal by Ambassador Mahaalouwii of the Kahaalio race. . . . Mr. Mahaalouwii, would you please state the proposal for the council." Kellnea backed away from the podium, retracting his eyestalks.

Mahaalouwii rose from his stall and quickly climbed the ramp, his six hooves clopping resonantly on the hollow quartz. He wore a red muftin robe, and, in deference to the other council members, a smell-absorbing packet covered his methane vent hole.

"Thank-you, most honorable Speaker," said Mahaalouwii, making the required bow toward Kellnea. The sapphire pendant around the ambassador's neck clicked on the quartz. He turned to face the council and called a prompt to the screen.

"My committee, the primitive cultures committee, has been studying an intelligent species on the third planet of system K359. They are the dominant species on that planet, which has an orbital period approximately equal to our standard galactic year. The species is based on carbon and water. They move by balancing on two hind legs, and they have only two other limbs, prehensible limbs that protrude from the upper part of their bodies. They call themselves 'humans.'

"In spite of their unusual mode of locomotion and their small number of limbs, the humans are an extremely promising species. Their pace of technological progress has been the most rapid of any studied in the 25,382 years of this council's existence, and we believe they have a high probability of becoming spacefaring within the next two hundred years. Because of their demonstrated adeptness at assimilating and improving technology, we feel certain they could contribute substantially to the galactic community.

"Unfortunately, our studies also show that the humans are in danger of destroying themselves. The species has shown violent, self-destructive tendencies throughout its development, tendencies which have not diminished as it progresses through its technological phase. Currently, the two dominant military alliances on the planet have arsenals of fission and fission-fusion weapons capable of destroying a significant fraction of the planet's surface.

"The detonation of these weapons would not immediately destroy the species. However, our studies further show that the dust raised into the planet's atmosphere by these arsenals would increase the planet's albedo. This would cool the planet and destroy much of its

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photosynthetic life, which is the humans' primary source of energy.

"It is difficult to determine the exact degree to which the albedo would be increased without a careful telematrophic study of the planet's atmosphere, which could not be done without the humans' knowledge. However, there is a possibility that the loss of photosynthetic life would be so severe and long-lasting that the humans would become extinct.

"In light of this danger, we propose that the humans be declared an endangered species."

Mahaalouwii paused a moment for emphasis and calmly swished the back of his robe with his tail.

"The second part of the committee's proposal is that immediate measures be taken to ensure the survival of the humans. First of all, a fission null field should be placed around the planet to render the arsenals harmless. My committee recognizes that this field is only a temporary solution, which the humans will eventually learn to overcome. Therefore, we further propose that the planet be visited by a contingent from the council, who will establish contact with the humans.

"It is unusual for this council to contact a species this early, but in this case we feel contact is warranted. With close contact and study, we feel certain that more permanent measures can be identified and implemented to ensure the survival of this most promising species."

Ambassador Mahaalouwii turned to the Speaker and bowed.

"Thank-you, Ambassador," said Kellnea. He faced the council. "The proposal is open for discussion."

The red light on top of Ambassador Rylampin's crystal tank lighted.

"I recognize Ambassador Rylampin," said Kellnea.

Rylampin swam a quick half stroke, bringing herself to the front of the hexagonal tank, her thick rolls of flesh almost pressing against the transparent crystal. Her skin was smooth and black, mottled with small yellow dots.

"First of all, let me say that I have followed with interest the progress of Mr. Mahaalouwii's committee. I, of course, have a special interest in any intelligent species on a water planet," said Rylampin. Her clipped, hooting calls resonated through the tank and were translated into standard galactic by the transponder at the tank's base. "I do agree with the committee that we should declare the humans an endangered species. They certainly deserve that designation. But, in considering the rest of the proposal, I think we need to look past the immediate danger to the humans. We also need to consider the long-term danger to ourselves.

"Now, we all know that it's not unusual for the dominant species on a developing planet to be violent and aggressive. That's often the reason it became dominant. But, after a species has asserted its dominance and started to develop technologically, it usually begins to lose its violent tendencies. In fact, until the recent study of the humans we thought it was *necessary* for a species to become peaceful for it to experience rapid technological growth. The humans seem to be a very special case.

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"And that begs the question, 'Can they change?'

"I have my doubts. To date, they have shown no evidence of becoming peaceful, even though they are well into their technological phase. Within the last seventy-five years, they have engaged in two extremely large-scale military conflicts. At the end of the last conflict the winning military alliance exploded into fission weapons over cities in the losing alliance, purposely killing thousands of non-military personnel.

"Now I ask the council, can you imagine what it would be like to have a species like that roaming the galaxy?"

Mahaalouwii interrupted: "the humans couldn't possibly pose a threat to us. The strongest weapons in their arsenals are fission-fusion weapons, and they don't have the ability to send them much farther than the planet's atmosphere."

"Perhaps not yet," said Rylampin. "But give them a thousand years, then what? If they maintain their high rate of technological progress, they could threaten any one of the fifty-five species on this council."

"A thousand years!" scoffed Mahaalouwii. He threw back his head and shifted his two front hooves. "By that time, they surely would have learned to be peaceful. Ms. Rylampin, with all due respect, I think your fears are unfounded. This species has simply developed too fast. It has entered its technological phase so quickly that it has not had a chance to adapt socially. Sociologically it's still somewhat barbaric. In a thousand years, it's incomprehensible to me that they wouldn't have changed."

Ambassador Nltchw Krrtllwrp sprang to her full height on eight black, slender legs, indicating she wished to speak. She wore a yellow shawl over her blue cylindrical body. Kellnea recognized her.

"I must agree with Ambassador Mahaalouwii," she said, her red, multifaceted eyes darting as her mouth-piece clicked in standard galactic. "I believe Ambassador Rylampin is not considering the beneficial effect that our contacting the humans would have on them. Surely, contact with us would tend to cause a change simply by our example." She waved her front two legs —prehensible limbs—for added emphasis. "And in the unlikely event that we do not see a change, we will have plenty of time to intervene, to train the humans, so to speak.

"I'm not advocating training them, of course. That's something we'd do only as a last resort. But my point is that I don't think the humans can really pose a threat to us, because we'll have a thousand years or so to deal with the problem if it arises. I think that the good we can do for this species far outweighs the risk to ourselves."

"Do you really believe you could train an entire species?" said Rylampin acidly, her side fins quivering slightly "There are five *billion* humans on that planet. You couldn't possibly do it—you would have to destroy them to stop them."

"That's ridiculous!" shouted Mahaalouwii with an angry snort.

"No! You're being ridiculous," boomed Rylampin, her transponder set at high volume. She suddenly realized the breach of etiquette she had com-

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mitted and lowered the volume before continuing: "With all due respect, Mr. Mahaalouwii, I believe your vision is clouded by your strong emotional desire to help this species. I feel sorry for them, too. No one likes to see a species at risk. But I can also see the danger to us, and I believe it is too great. We should continue to study the humans, definitely. If they decide to become peaceful—and I sincerely hope they do—we should welcome them into the council.

"However, if they retain their violent nature, I don't believe there's anything we can do for them. If they insist on destroying themselves, it's best for the galaxy that we allow them to do so *before* they leave their planet."

"I can't believe that you would leave this race to die just because of a slight possibility that they could pose a danger to us," said Mahaalouwii, his nostrils flaring.

"I'm not proposing that we leave the race to die; I'm just proposing that we leave them alone."

Mahaalouwii began to speak but stopped when Kellnea extended his eyestalks.

"I think there's another issue to be considered here," said Kellnea. "And that's the issue of motivation. Everyone in this chamber agrees that we want the humans to change—indeed, the humans themselves want to change. But no change occurs without motivation. And that is the problem with the proposals I've heard today—imposing a fission null field, trying to train the humans. Currently, the humans have the strongest possible motivation for change—a threat to their very existence. If we remove that threat we also remove the motivation, making change more difficult and less likely."

"Do you mean that you, too, advocate leaving this species in jeopardy?" said Mahaalouwii, aghast.

"I'm not so sure the danger is as great as you would have us believe," said Kellnea. "I have assimilated all your committee's reports. They show that, even in a full-scale nuclear exchange on the planet, the chances of a complete extinction are quite small."

"Yes, but even if it didn't destroy the species, the humans could be irreparably harmed. At best, the humans' technological progress would be retarded by at least a hundred years."

"Perhaps . . . I won't argue that point. But I also think the likelihood of a full-scale nuclear exchange is small. Remember that the human race has lived with this threat for some time yet has managed to survive. Indeed, no nuclear weapons have been used in war since the initial two detonations during the last large conflict. That's a remarkable record for a violent species and shows that the humans fully realize the danger and are taking steps to prevent their own destruction."

"But for how long, Speaker Kellnea? The humans' arsenals have increased greatly over the past fifteen years. How long will they continue to refrain from using them?"

"How long, yes, that's just the point!" boomed Rylampin. "You want to impose a fission null field, and I agree that it would work—for now. But how long can you keep it up? You admit that the humans will probably learn to overcome

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the null field. You can't protect them forever."

"And that brings up my final point," said Kellnea. "This council has had a long-standing policy of not contacting a developing species. That policy is based on a very sound principle: namely, that growth in a species must occur from within or it is not lasting. That's exactly the point that Ms. Rylampin is making: if you apply an external, artificial stimulus to change a species, you must continue to apply that stimulis indefinitely or the species will revert back to its original behavior. In the case of the humans, I think the policy is especially sound, for the humans are an inventive species, prone to ingenious and surprising solutions. I wouldn't be surprised to see them find a solution that we could not possibly anticipate, a solution that would be much better than anything we could invent."

"Well," said Mahaalouwii, "I agree that the humans are inventive. And given enough time I'm sure they would eventually devise a solution. But they might not have that time; they might destroy themselves first. I understand all the reasons we don't contact developing species, yet in this case I still think it's the right thing to do. We must not leave the fate of such a promising species to chance."

"Ah, Mr. Mahaalouwii, but you are assuming that we definitely could save them. And if you consider only the nuclear threat, you are probably right —given a sustained effort we could probably protect them indefinitely. But you must bear in mind that nuclear war is not the only danger the humans face, for they are experimenting with new and powerful technologies at an accelerating pace. For example, they are constructing new life forms by altering the DNA that is the blueprint for life on the planet. They are at the threshold of constructing molecular, self-replicating machines —machines that could be designed to enter a human body and repair it or, if properly designed, destroy it.

"These technologies, and others, hold the potential for great benefit for the humans and, perhaps, for us. But they also hold the potential for great destruction if used as instruments of war, and they are far more complicated than nuclear technology. Thus, intervention by us would be far more difficult than imposing a simple fission null field. And, given the humans' accelerating rate of progress, we might not be able to act quickly enough to avert the danger."

Kellnea paused and turned to face Mahaalouwii. "So, Mr. Mahaalouwii, I truly do share your concern for the humans. The possible extinction of a species, especially an intelligent one, is a terrible thing—a great concern to all intelligent beings in the galaxy. But, when I weigh all the factors, I conclude that we should leave the humans alone for now. It troubles me to leave this species at risk, but I feel it's the only way. If a solution is to be found, the humans must find it for themselves."

Mahaalouwii faced Kellnea squarely and fixed him with a steady glare. His nostrils flared, his muscles rippled, and his back two hooves grated rhythmically across the quartz like an angry Kahaalio bull preparing to attack. An expectant silence descended over the chamber.

Kellnea waited impassively for several seconds, watching Mahaalouwii

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from each of his six bulbous eyes. "Well, Mr. Mahaalouwii," he said, "do you wish to discuss the proposal any further, or should I call for a vote?"

For just a moment, Mahaalouwii's eyes flashed. Then, gradually, his shoulders sagged, and his face softened into the contented chewing expression of the Kahaalio race.

"Matr'sed, old friend," he said, so softly that only Kellnea could hear him, "I regret to say that I find your analysis of the situation impeccable . . . as usual." He threw back his head and turned slowly to face the council.

"Fellow council members," he said, "after considering the arguments raised by Speaker Kellnea and Ambassador Rylampin, I withdraw my committee's proposal. Instead, I substitute the following proposal: this council should declare the humans an endangered species but should not contact them at this time. However, we should continue to study them carefully." Ambassador Mahaalouwii turned to the Speaker and bowed.

Kellnea the Wise nodded his eyestalks approvingly and sounded the voting claxon.

The proposal was accepted by a vote of fifty-two to three. ■

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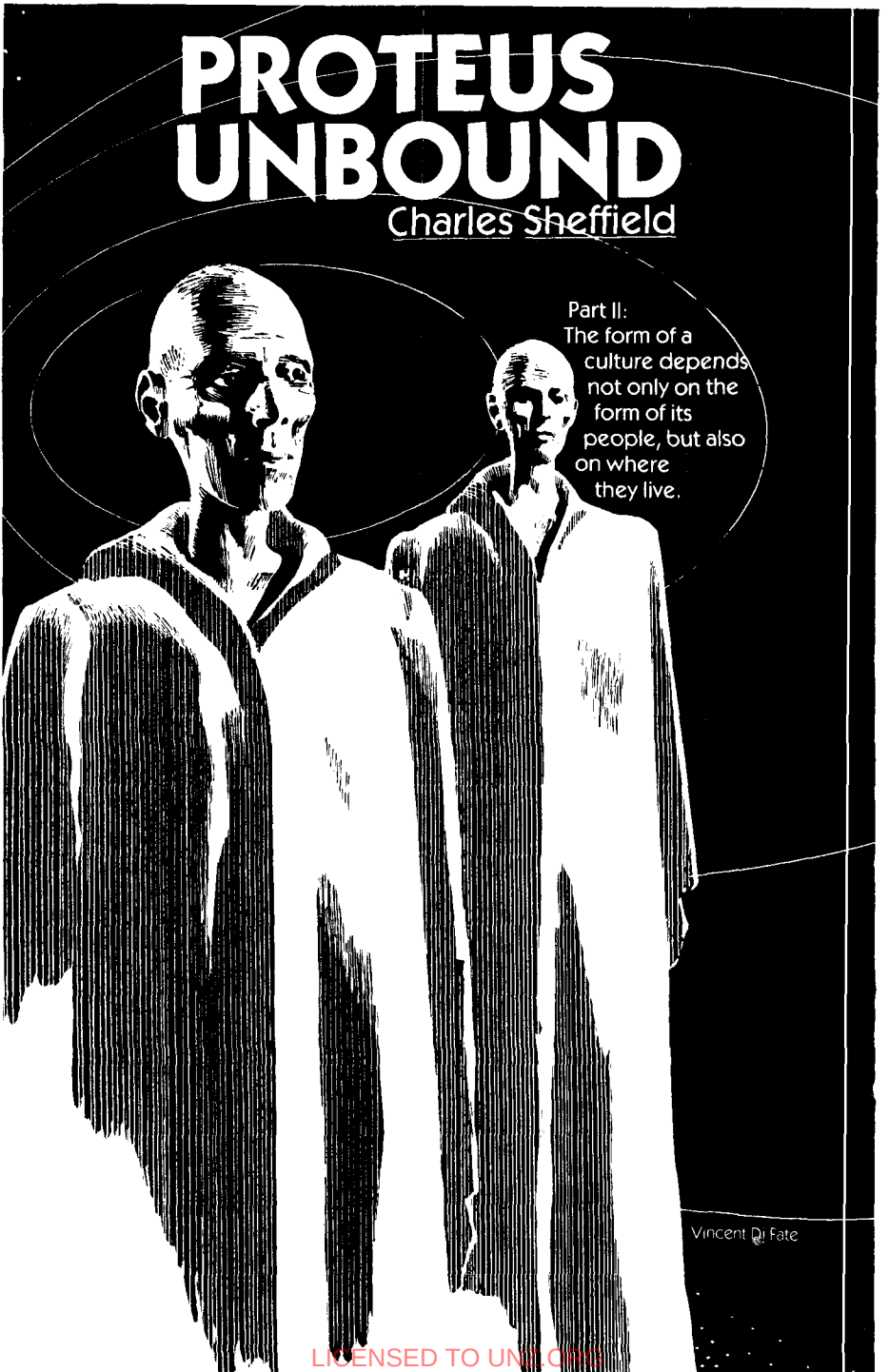
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Charles Sheffield
Part II:
The form of a culture depends not only on the form of its people, but also on where they live.
Vincent Di Fate

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SYNOPSIS

The life of **Behrooz Wolf,** *former head of Earth's Office of Form Control, has reached low ebb. Deserted by his long-time female companion,* **Mary Walton,** *and fired from his job in Form Control, Wolf is plagued by hallucinations. He keeps seeing the* **Dancing Man,** *a jerky, capering figure invisible to anyone else, who dances before Wolf and talks to him in a strange, near-comprehensible language.*

Wolf is sinking farther into hopelessness and a fatal addiction to Dream Machines when he is visited by **Leo Manx.** *Manx is a* **Cloudlander,** *a citizen of the Outer System and one of the thinly-scattered millions of humans who inhabit the Oort Cloud, the huge, spherical cometary cloud many billions of miles from the Sun. Manx tells Wolf that the Outer System needs his assistance. The* **form-change tanks,** *combinations of computers, telemetry, and biofeedback equipment that permit humans to perform purposive form modification have been malfunctioning in unheard-of ways. Wolf refuses to help, knowing that the people of the Inner and Outer Systems dislike and distrust each other, and also believing that Mary Walton left him for a Cloudlander. He tells Manx that he does not wish to leave Earth. He changes his mind after another hallucinatory visit from the Dancing Man. Together, Wolf and Leo Manx set off for the Outer System.*

On their way, they must pass close to the **Kernel Ring.** *This is an annular region where the* **power kernels** *are found, the Kerr-Newman black holes which are used as the major energy sources for both the Inner and Outer Systems. The Kernel Ring is also a region without a central government, the home of rebels who prey on ships passing between the Inner and Outer System. Manx tells Wolf that he has evidence that Mary Walton ran off not with someone from the Oort Cloud, but rather with a man from the Kernel Ring.*

As their own ship transits the Ring, Manx tells Wolf of a powerful and dangerous rebel leader known as **Black Ransome.** *No more than a vague legend back on Earth, Ransome is feared in the Outer System as a cunning, charismatic figure, with his own well-hidden and well-defended stronghold,* **Ransome's Hole,** *located somewhere in the Kernel Ring.*

Wolf and Manx make their transit of the Ring safely, and arrive at the **Opik Harvester,** *one of forty huge collection and processing facilities that process cometary materials, and convert their organic molecules to food substances. The reception committee that meets Wolf consists of* **Cinnabar Baker,** *one of the three most powerful people in the Outer System, a woman who controls all the Harvesters and is also the head of the Outer System's intelligence network;* **Apollo Belvedere ("Aybee") Smith,** *a brash young scientific genius and Cinnabar Baker's chief science advisor; and* **Sylvia Fernald,** *who is responsible for software development and control theory in the Outer System, and will be working closely with Wolf on the form-control problem. Like all Cloudlanders, they look radically different from Earth people, and they and Wolf find each other mutually repulsive in appearance.*

Sylvia Fernald describes the problems they have been having with their

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form-change equipment. As she does so, however, it becomes clear to Wolf that it is not merely form-change equipment that is failing. There is widespread failure of communications equipment in the Outer System, failures for which the Inner System are being increasingly blamed. It seems strange to Wolf that he would be singled out to be brought to the Oort Cloud, when there are many other control system specialists available in the Inner and Outer System. When he points that out to Cinnabar Baker, she agrees with him. She tells him that they had originally picked out twenty-seven people who might help them. Of those twenty-seven, twelve are dead, seven are insane, and seven have disappeared; Wolf is the only one of the twenty-seven left to work with the Cloudlanders.

With that sobering thought in mind, Wolf goes off to his rooms. Unable to sleep, he decides to take a closer look at the inside of the Opik Harvester. As he is doing so, he is unexpectedly attacked by three Cloudlanders. He manages to escape and get back to his own quarters, where Aybee Smith is waiting for him. Aybee tells Wolf that there is bad news, one of the Harvesters on the far side of the Cloud has been destroyed, and many of the Cloudlanders are blaming Earth and the Inner System. Anyone on this Harvester who looks like an Earthman is in danger of mob violence. However, that will not be a problem for very long; there have been new reports of form-change problems from the Sagdeyev Space Farm, and Wolf and Sylvia Fernald are to head out there the next day.

Before they leave, Cinnabar Baker has a private session with Sylvia Fernald. Baker has with her only her constant companion, an old, bedraggled crow called **Turpin,** *and she tells Fernald in strictest secrecy that she does not fully trust Wolf. She wants Fernald to try to achieve a close personal relationship with him. Sylvia Fernald points out that Wolf is physically repulsive to her, and she is sure he thinks about her in the same way. Baker does not press the point, but she makes it clear that she would like Fernald to get as close to Wolf as possible. Fernald leaves, now dreading the trip to the Sagdeyev Space Farm alone with Wolf.*

That trip turns out to be far easier on Sylvia Fernald than she expected. Just before they leave, Aybee gives Wolf a device he has built after discussing Wolf's hallucinations with Leo Manx. Manx has become convinced that the problem is created by external stimulus, and he wants to study the form of the illusion. To permit him to do so, Wolf needs to capture the exact recollection of the hallucination, and Aybee's device will allow him to do so through an iterated feedback matching of memory against stored scenes. Wolf puts the machine headset in position once they are safely on the way, and becomes locked in an endless cycling of memories. It is only through Sylvia Fernald's intervention that the cycle is broken.

When Wolf returns to normal consciousness he is exhausted, but Aybee's device has done its job. Wolf's hallucinatory memories have been captured exactly and can now be studied objectively. While he sleeps, Sylvia studies the sequence of images, and by changing time-sequence and speed she is able

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to make sense of them. She plays the reprocessed signal to Wolf when he again wakes. The little dancing figure can be understood now. He is telling Wolf that no matter where he goes or what he does, he will never escape the **Negentropic Man.**

But more than that, Sylvia recognizes the Dancing Man. She has seen pictures of him before. It is Black Ransome, the legendary rebel from the Kernel Ring.

CHAPTER TEN

"Manx is on the way." Sylvia floated into the open bubble that looked out to the stars and secured herself next to Bey. "Flying a high-acceleration probe. He'll be here in twelve hours."

"He must be keen." Bey thought for a moment. "And cramped. The hi-probes are emergency equipment—the cabin's less than six feet across. He won't have room to turn."

"He'd better not try—it's a one-person ship, and Aybee says he's coming with him." Sylvia sounded quite cheerful at the thought. If she could survive the forced intimacy of her trip with Bey, she was prepared to let Aybee and Leo Manx suffer through their shorter travel time. "I told him what we found," she went on. "He can't wait to see it for himself."

They were at the Space Farm, and ready to disembark. Bey, accustomed to the formal (and protective) procedures for entry to Inner System ports, was baffled by the absence of quarantine. They had flown to a point near the central hub of the Farm, and been docked automatically without passing a checkpoint.

"Of course we were checked," said Sylvia, when Bey expressed his surprise. "The computer checked our ship's I.D. when we were still hours away."

"But if the wrong people were inside it—" began Bey. He stopped. Cloudland was so far from the Inner System in awareness of security measures, he could talk to Sylvia forever but he doubted if she would fully understand him. Was this why a handful of rebels from the Kernel Ring could cause such chaos in the Cloud?

The failure to understand went both ways. Bey had been briefed on the Sagdeyev Space Farm, but somehow he had reduced it in his mind to a size that he could comprehend. A farm suggested solidity, intensive activity, compact production. The reality was so insubstantial that he felt they had arrived nowhere.

The Farm was a mono-molecular collection layer, two billion kilometers across. Its crop had been seeded hundreds of parsecs away and thousands of years ago, conceived in the fiery heart of supernovas and blown free by the same explosions. The harvest had drifted through space for millennia, borne on the winds of light pressure, until random galactic airs carried the precious atoms to the Cloud. Most of them would drift on until the end of the Universe, but a few would encounter and be held by the electrostatic charge of the collection layer. For them, aggregation could finally begin.

It was slow and selective work. The Farm was interested only in the heavy elements, metals and rare earths and noble gases. It winnowed billions of cubic miles of space to find their invisible traces.

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The machines that monitored the Farms needed no central processing facility. They could carry hundreds of tons of material with them, accumulating steadily until there was enough to ship to the Harvesters. The humans, frailer creatures, needed more. At the center of the collection layer sat the habitation bubble, three hundred meters across. In it dwelt the score of people who had made the Farm their home. Two of those were now dead.

"Don't expect anyone to meet us," said Sylvia, as their ship docked at the outer edge of the bubble. "In fact, don't be surprised if we don't meet anyone in all our stay here. The Farmers avoid strangers, and that includes me as well as you. They know we're here, and they appreciate our help. They just don't want to see us."

"Suppose we need to talk with them about the form-change problems?"

"We'll probably do what they do themselves—use a communications link." Sylvia led the way to the bubble interior, meandering along silent corridors that spiraled down through the concentric shells of the bubble. Everywhere was deserted, without even maintenance equipment. If Sylvia had not told Bey that there were people here, he would have believed the Farm to be derelict.

Sylvia was heading for the kernel at the center of the bubble, but on their way they passed an area that was clearly an automated kitchen. Bey realized that he had not eaten since they left the Harvester. During the whole trip to the Farm he had been either unconscious, or too preoccupied to consider food. He paused.

"Once we get to the form-change tanks we'll be in for a long session. Can we grab something here?"

He was starving. He headed for the dispensing equipment without waiting for her answer, and placed an order. He did not bother to study the menu. Food in the Cloud was nothing like Earth fare, and he did not much care what he was given. When his dishes appeared he went across to the seating area and waited for Sylvia.

She was a long time coming. When she finally arrived she sat angled away from him. Her tray held a modest amount of food and a large beaker of straw-colored fluid. She stared at the liquid for a long time, then finally took a little sip, grimaced, and swallowed.

"Is it bad?" Bey lifted up a piece of food and sniffed it suspiciously. It looked like bread, and it smelled like bread. "Maybe we worked the machine wrong."

"No." Sylvia turned and gave an apologetic shake of her head. "The food is fine. The drink, too. But I've not eaten a meal with someone else for years. It's not a law or anything, but we don't do it, you know, except with a partner. Go ahead and eat, and please excuse my rudeness. I'll be used to this in a minute."

Not just hairy and unpopular; his habits were disgusting, too. Bey put down the bread he was holding. "I'm the one who should apologize. I knew Cloudland customs, but Leo Manx and I ate together all the time on the way to the Outer System. I didn't even think of it here."

"Leo was specially conditioned for the assignment. But really, it will be all right. It will. Watch me." She speared

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a yellow cube on her fork, squinted down at it in front of her nose, and put it stoically into her mouth. She chewed for a long time before she finally swallowed. "See! I did it."

After a moment Bey began to eat his own food. "Is it all right if we talk while we eat? Or would that be too much?"

"Of course. I would prefer it."

Bey nodded. So would he. The food was pretty terrible, bland and flavorless. *Good thing I couldn't order the meal I'd really have enjoyed,* he thought to himself. *Come to Earth, Sylvia, and let me introduce you to a broiled lobster.* "I wanted to ask you about Ransome," he said after a minute of silent chewing.

"I don't know all that much."

"But you knew enough to recognize him. Back in the Inner System, most people don't even believe there is a Black Ransome. And Leo Manx told me that he's a mystery figure. If he's such an unknown quantity, I don't see how you could possibly have recognized him."

"Ah." Sylvia stopped eating and laid down her fork. She had managed only three small mouthfuls. "I wondered when you would get around to that. Did Leo tell you about my background?"

"A little."

"Paul Chu?"

"He did mention that. But only to say that you and Chu used to be partners, and he disappeared on a trip to the Kernel Ring. His ship was attacked, and he was taken prisoner."

"That's the official version, and I don't dispute it. But I don't believe it." Sylvia paused. Did she want to talk about her personal history with Bey Wolf? She would rather talk than eat, but he might misunderstand her reasons.

"Paul and I lived together for nearly three years," she went on. "Most people who knew us thought it was permanent—I'm sure Leo thought that. But it wasn't. We argued like hell, all the time. If Paul were around now, I don't think we would be together."

"I heard from Leo Manx that you were planning to have children."

"No. That's Leo's wishful thinking. He's such a sympathetic type, he likes to think the best of people. He may have heard Paul and me talk about having children, a long time ago—but even when we were splitting up, we never disagreed in public."

"Why did you fight?"

"Not what you might think. Not sex. Politics. I'm sure you suspect I'm not friendly to Earth and the Inner System. I'm not. I believe that you are like parasites—and not even smart ones. You've failed the first test of a successful parasite: moderation. You wiped out parts of your own habitat—the passenger pigeon and the dodo and the whale and the gorilla and the elephant. Thanks to you, half the species on Earth have become extinct in less than a thousand years. Humans may be next."

"I agree, and I'm as sorry about it as you are." Bey looked at her earnest face. She was angry now, but that made her an easier companion. The cold, wary Sylvia was more difficult to deal with. "You sound pretty extreme about it."

"Extreme! Me? Bey Wolf, you don't understand. I'm a *moderate*. Everyone in the Cloud feels the way I do about Earth and the Inner System. We learn

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it when we're little children. But most of us would never do anything to harm the people of the Inner System. It's just a few fanatics, who want to go a lot further than general dislike. Paul was one. He *hated* the Inner System, and everything you stand for. One year before he disappeared, he joined an extremist group who talked seriously about starting a war between the Inner and Outer Systems. Paul told me their ideas, and asked me to join. I told him they were all crazy."

"We have people back on Earth who feel the same, but the other way round. They hate the idea that the Cloud controls food supplies. They want to crush Cloudland and control the Outer System. But they're all mad, both sides. If we went to war with you, or cut off communications, it would be like men and women refusing to have anything to do with each other. We could do it, but our species would die out in a generation."

"Paul said it wouldn't work like that. After the collapse of the Inner System, there could be a new start for everyone. But it would need a group that was all ready for the takeover, with its own strong leader. He showed me a secret piece of recruiting material. I decided that the whole thing was crazy, and the leader—Ransome—was craziest of all. But apparently he's terribly plausible and charismatic. Paul thought Ransome was wonderful. He said that Black Ransome had a secret weapon, something that made sure he would win, even if he didn't have many followers. I could see that people were following Ransome's ideas, even though they were wild."

Sylvia had pushed her own plate away from her, but she was watching intensely as Bey continued eating. He found it disconcerting. There were odd undercurrents flowing beneath this conversation, a sense that he was performing some old, disgusting, and perversely erotic rite, when all he was doing was eating a dreary piece of synthetic protein.

"But then Paul disappeared," added Sylvia at last. "And I feel sure he didn't die, and he wasn't captured. He's somewhere in the Halo. Probably in the Kernel Ring—he's an energy specialist. I think he's working for Ransome. But I never found out what that 'secret weapon' might be."

"Did you actually meet Ransome?"

"Not in person. But I saw his video image when he called with a message for Paul. He's your Dancing Man, I'm quite sure of it."

"If he's the Dancing Man, I'll never forget him. It's burned into my brain, exactly what he looks like and sounds like. Do you know a way to reach him?"

"Not directly. He hides away in the Halo, but he has more and more influence all through the Outer System." Sylvia had taken another sip from her beaker. She was peering at Bey's moving jaws, her grey eyes glistening.

He stopped eating. "I believe what you've told me, Sylvia, but it doesn't explain anything. I can accept the idea of Ransome as the leader of an organized terrorist group. I can even see how influential he might become in the Cloud. But I can't see why he would appear on a crazy message to *me*."

"Maybe he hopes to recruit you, too."

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"That's ridiculous. For one thing, you don't recruit people by sending messages that drive them crazy and that they can't understand. For another, he has no idea who I am."

"Cinnabar Baker told me you are very famous, the top form-change theorist in the Inner and Outer System."

"That isn't enough to make anyone *famous*. Sylvia, Earth has lots of form-change specialists. I'm just one of them. You have to remember there are five hundred times as many people in the Inner System as there are out here."

"I know. If I had my way, we'd stay like that. Paul and I argued about this, too. He said the Cloud is underpopulated. I feel it's just right. We don't *need* more people. I don't think I could stand to live in the Inner System."

"Ransome probably feels the same way. Out here, he's a big boogey-man who's trying to start a war. He steals ships, he has a secret weapon, he kills people."

"But to some, like Paul Chu, he's a hero. Paul says he started out as a Podder. He tried to do development deals with the Inner and Outer Systems, and he only became a renegade when he was betrayed by both."

"Maybe he's good, and maybe he's bad. He's certainly famous here. But back on Earth he's just a bedtime story that people tell to their children. A lonely, mysterious outlaw, Captain Black Ransome, flying the Halo in a creaking, battered ship, solar sails tattered and decaying. He drifts silent and powered-down whenever there's a danger of discovery. He steals power, supplies, and volatiles wherever he can find them. He's the space version of the Flying Dutchman."

"Who is that?"

"An Earth legend. A man who sails Earth's oceans, endlessly seeking redemption. Deep water is his home. He never finds a landfall. He's not quite real, but he's very romantic. That's the way we think of Ransome, a combined myth and outlaw. If you suggested to someone from Earth that Ransome was trying to recruit me—a Sunhugger, a planet man who's only happy at the bottom of twenty miles of atmosphere—they'd say, well, they'd say that you were losing it. Crazy."

"*You're* from Earth. Are you saying I'm crazy?"

Bey sighed. "Not crazy. Maybe a little strange and unpredictable. Come on, Sylvia, let's get moving. I want to see the Farm's form-change systems before Aybee and Leo arrive."

"I hope you'll find something. You know, Aybee looked at the failed form-changes on the Harvesters. He got nowhere, and he's awful smart."

"He certainly is."

"And he'll see this as a sort of contest, just the two of you. Do you think you can handle him?"

"I'll bet on it." Bey had finished eating. "I learned something a long time ago. My first boss wasn't a good scientist, and he had dozens of political fights with bright young people from the General Coordinators' office. They were mostly right, but he won, every time. I asked him how he did it. He pointed out the sign on his office wall." Bey allowed Sylvia to steer him out of the galley. " '*Old age and treachery will defeat youth and skill,*' he told me. It's

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one of the world's great truths. Aybee happens to be on the wrong side of the inequality."

CHAPTER ELEVEN

"Those are pearls that were his eyes;
Nothing of him that doth fade,
But doth suffer a sea-change
Into something rich and strange."

Behrooz Wolf was four trillion kilometers from home, floating uncomfortably in free-fall in the territory of people who hated him, surrounded by a silence so total that it hurt his ears. In that environment, the familiar technology of form-change was his life-line.

Sylvia had led him to a chamber containing four change tanks. Two of them were empty. The others contained the bodies of two dead Farmers. At Wolf's request, they had been left untouched by their fellows until he arrived at the Farm. He and Sylvia went at once to the transparent ports and peered in.

She took one look and turned away. Bey heard the sound of retching. He ignored it. He had seen too many illegal and unsuccessful form-change experiments to allow them to affect his stomach. He had work to do.

He rotated the two bodies using remote-handling equipment, and examined their anomalies with the tank's internal sensors. Both were originally male, and according to the tanks' settings both had been using the same program. The intended end-point was a form with thickened epidermis, lowered metabolic rate, and eyes protected by translucent nictitating membranes. The men had been preparing for an extended mission outside, away from the Farm's main bubble. According to Sylvia, such missions were absolutely routine, and the form-change program that went with them had been used a thousand times.

Bey would not take her word for it. He intended to go over that program, instruction by instruction. But first he wanted to localize the problem area; and the only evidence for that was the end products in the tanks.

He studied the two corpses. Both men had experienced significant mass reduction—not called for by the program. The limbs had atrophied to stumps and their torsoes had curled forward, to leave the overgrown head close to the swollen abdomen. Death had come when cramped and shrunken lungs would no longer permit breathing.

"Did you ever see forms like that before?" said Sylvia softly. She had herself under control, and was hovering just behind him.

He shook his head but did not speak. It would take a long time to explain that the final form was close to irrelevant. His diagnosis of program malfunctions was based on more subtle pointers: the presence of hypertrophied fingernails and toenails on the flipper-like appendages, the disappearance of eyelids, the milky, pearl-like luster of the membrane-covered eyes, the severe scoliosis of the spinal column. To someone familiar with form-change, they were signposts pointing to certain sections of program code.

Bey began to call program sections for review. His task was in principle very simple. The BEC computers used in purposive form-change converted a human's intended form to a series of

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bio-feedback commands that the brain would employ to direct change at the cellular level. Human and computer, working interactively, remolded the body until the intended form and actual form were identical, then the process ended. The chemical and physiological changes were continuously monitored, and any malfunction would halt the process and set emergency flags. The process could fail catastrophically in two ways: if the human in the tank did not wish to live; or if there were a major software problem.

Bey could rule out the idea of suicide. It resulted in death without any physical change except biological aging. That seemed to leave nothing but software failure, but he could see one other complication: this equipment had not been provided by BEC. It was a hardware clone, and the programs that went with it were pirated versions. There could be hardware/software mismatches, something that only BEC guaranteed against. His job with this setup would be ten times as hard.

He began to examine a new section of code. Behind him, he was vaguely aware that Sylvia was leaving the room. That was a relief. She could not help, and she was a potential distraction.

Line by line, he followed the programmed interaction, tracking physical parameters (temperatures, pulse rate, skin conductivity) and system variables (nutrient rates, ambient gas profile, electrical stimuli). He did not check those parameters against any equipment performance specifications. He did not need to. The region of stability was well mapped, and over the years he had learned the limits of tolerable excursion from standard values. All the programs in use provided their own audit trail, as they were swapped in and out of the computer together with chemical readings and brain activity indices. Reading and interpreting them was somewhere between an art and a science. It was something he had been doing for two-thirds of his life.

He sat there for six hours in a total trance. If anyone had asked him if he were enjoying himself, he could not have given a truthful answer. He was not happy, he was not sad. All he knew was that there was nothing in life that he would rather be doing. And when he found the first anomalies, and began to piece together a picture, he could not have described the thrill. He had been provided with a precious broken ornament, shattered into a thousand pieces. He had to recreate it. As he fitted those fragments together, one by one, tentatively and painstakingly, he sensed the skeletal outline of a total pattern. That was exhilarating. But no matter what he did, the picture remained tantalizingly incomplete. And that was unbearably frustrating. Not all of the pieces had been provided. Parts of the code were not in the system at all.

He was roused by the sound of Sylvia Fernald's voice. She had entered the room with Aybee Smith and Leo Manx in tow. Bey turned and addressed his question to all three of them: "These form-change tanks aren't completely self-contained, the way the BEC units would be and should be. Where's the rest of the computation done?"

"That must be in the main computer system for the Farm," said Aybee at once. "It's a lot less expensive to do

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some of the analysis there. BEC and the other manufacturers rip you off bad. They overcharge you ten times for storage in their units. Is there a problem to use distributed computing? We do it a lot."

"It *shouldn't* be a problem. On the other hand. . . ." Bey gestured into the port of the form-change tank. Aybee came close and stared in, frowning, for thirty seconds. Leo Manx couldn't take more than one horrified glance.

"I've checked the code, line by line," Bey went on. "And I'm convinced that the local programs here are working fine. It means that the problem has to be over in the main computer."

"Or in the communication lines," said Aybee.

"No." Bey shook his head, and suddenly felt his exhaustion. "Redundant transmission should correct for electronic noise in the signal. Even if that somehow weren't working, thermal noise or outside interference would give *random* errors. What we're seeing here is definitely not random change. It was closely calculated."

"But that makes it murder," protested Leo Manx.

Aybee gave him a fierce grin. "I guess that's exactly what the Wolfman is saying. And in that case, we'll have to meet with the Farmers." He waved aside Sylvia's objection. "Don't tell me, Fern, I know they won't want to do it. But for murder, they don't have a choice. You real sure about this, Wolf?"

"Positive."

"I mean, you wouldn't like me to check your results?"

"I'd love you to—or at least, I'd like to see you try. If you were really lucky and smart, that would take you about a month." Bey shook his head. "Aybee, it's not a question of your ability—but I *know* this stuff, inside and out. Believe me, it would take you a week just to rule out impossible combinations of the main variables. We don't have time for that. I'll take your first suggestion. Let's go meet with the Farmers. Right now."

"Hey, what about your Negentropic Man? That's what me and Leo came here for, not to look at dead things that make you puke."

"Plenty of time to look at that, too. We can do it while Sylvia talks to the Farmers." The interaction with Aybee was a fight with sharp weapons. The other was aggressive—and *smart*.

"More time than you think," added Leo. "The Farmers may not agree to meet with you, Mr. Wolf."

"They have to," insisted Aybee.

"With *us*, they have to," said Sylvia. "They might be able to refuse to meet somebody from the Inner System, and get away with it."

"Then don't tell 'em where he's from." Aybee sounded impatient. "You and Leo can sort that out. The Wolfman and me need to see the stuff from inside his skull. Right? Let's get at it."

CHAPTER TWELVE

"I know more than Apollo
For oft when he lies sleeping,
I see the stars at bloody wars,
In the wounded welkin weeping."

"The Neg-en-trop-ic Man." Aybee

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dissected the word, saying it slowly and thoughtfully. "And there he goes."

He pressed the button. For the tenth time, the grinning figure in red danced away across the screen and waved his goodbye.

"Any ideas?" When it wasn't form-change theory, Bey was ready to admit that Aybee had the better chance of deciding what was going on. Sylvia might return at any moment, and Bey wanted to have a lot of his thinking done before he ever encountered a Farmer.

"Too many ideas." Aybee scowled at him. "It's not a well-posed problem."

"You don't think he means what he says?—that he's a man with negative entropy."

"I'm sure he isn't. For a start, negative entropy has no physical meaning." Aybee made a rude noise at the display and turned it off. " 'Negentropic' just refers to something that decreases the entropy of a system. So a Negentropic Man ought to be a man who reduces entropy."

"But what exactly *is* entropy?" Leo Manx had been listening carefully, while the conversation made less and less sense to him. "Remember, I'm supposed to send a report back to Cinnabar Baker. I can't send her your gibberish about negentropy, she'd jump all over us."

"Hey, is it my fault if you're a dummy?" Aybee looked down his nose at Leo. "I'll give you a bunch of entropy definitions. You can pick any one you like. And don't blame me if you're wrong, because I sure as hell don't know how the word is being used here. Oldest use: entropy in *thermodynamics*. Entropy change was defined as the change in the heat in a system, divided by its temperature. Can a process involving heat transfer be run backwards? If not, the entropy of the system must increase. Rudolph Clausius knew that, nearly four hundred years ago. He pointed out that entropy tends to go on increasing in any closed system. If the Universe is a closed system, its entropy must increase. So then the Universe is running down, and we'll all end in uniform-temperature soup."

"But we're talking about a *man* here, not a Universe."

"I know that, Leo. Hold on a minute, I'm getting there. Remember, this is complicated stuff. We don't want to make it so easy it's meaningless. Einstein said it right: things should be as simple as possible—but not simpler. Maybe our Negentropic Man has something to do with thermodynamic entropy, maybe not. Entropy number two: Ludwig Boltzmann found a *statistical* definition of entropy, in terms of the number of possible states of the atoms and molecules of a system. He showed that it produced the same value as the thermodynamic one, provided the system has a whole lot of possible states."

"How do we decide which definition we want?"

"We can't—not yet. We keep going, then we'll play pick and choose. Entropy number three: in *information theory*. Fifty years after Boltzmann, Claude Shannon wanted to know how much information a message channel could carry. He found it depended on a particular mathematical expression. The formula was the same as Boltzmann's entropy formula, so Shannon called the

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thing he calculated the *entropy* of the transmitted signal. That confused the hell out of people. The information-theory entropy is a maximum when the information carried is as much as you can get with a given channel.''

''Aybee, you're not helping. Three forms of entropy—and not one of them intelligible. Why don't people use clearly-defined terms?''

''Hey, I understand them fine. We're lucky there's only four to pick from. Do you have any idea how many different things the word *conjugate* can mean in mathematics? One more to go. *Kernels* have entropy. Even a non-rotating kernel—a Schwarzschild black hole—has an entropy. Two hundred and fifty years ago, Jakob Bekenstein pointed out that the area of a kernel's event horizon can be *exactly* equated to an entropy for the black hole.''

''But we have to pick one of your four definitions! Aybee, how can we possibly do it? They're all totally different.''

''No. They sound it, but they all tie together through the right mathematics. The mathematics of ensembles, it's called. As for deciding which one we ought to be thinking about . . . don't ask me. Spin a coin. Thermodynamic entropy, statistical mechanics entropy, information theory entropy, kernel horizon entropy—which one is Wolfman's buddy talking about? We don't know. But there's more. Before you spin that coin, let me give you the other half of it. You see, the Universe moves to higher values of thermodynamic entropy—that's Clausius, and the Second Law of Thermodynamics. But *life*—any life, from us to bacteria and single-celled plants, is different—''

Aybee was interrupted. Sylvia Fernald hurried into the room, grabbed his arm, and began to pull him at once towards the door. ''They'll meet with us,'' she said. ''But we have to do it right this minute, before they change their minds. Come on.''

She led the way for Aybee and Leo, leaving Bey floundering along behind. The others were expert at moving in low gravity. He still rolled and yawed and missed handholds. He reached the chamber half a minute after the others, and looked around for the elusive Farmers.

The room was dark and divided in two by a wall of ribbed black glass. As Bey stepped forward, dim ceiling lights came on and the glass wall lightened to full transparency. On the other side of the partition, shrouded in white garments that left visible only dark pairs of eyes, two human figures became visible.

''Five minutes,'' said a deep, whispering voice. Cowls were pushed back, to reveal smooth skulls and nervous skeletal faces. ''We promised at most five minutes.''

''Did you see your people in the form-change tanks?'' asked Bey at once.

''I did,'' said the taller figure. The deep voice was expressionless. ''I found them.''

''Were they alive?''

''Already dead. According to the temperature monitors, already cold. They must have been dead for at least a day.''

''And no emergency signal was sent from the tanks?''

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"Nothing. All indicators showed normal."

"Has anything like this happened before? Something maybe less extreme?"

There was a pause, while the two Farmers turned to look at each other. "Tell them," said the second figure. It was a woman.

"I think we must." The man turned back to Bey. "We had noticed some peculiarities. Nothing serious, nothing that was not corrected on a second attempt with the form-change equipment. We considered calling for help, but after a vote we decided against the intrusion. Our colleagues who died took part in and approved of the decision."

"You know when the problem began," said Bey rapidly. The two Farmers were beginning to move about uneasily. "Can you relate it to anything else that happened here on the Farm? Any visitor, any change in procedures?"

There was another pause—precious seconds of interview time slipping away. "The problems began six months ago," said the woman. "There have been no visitors to the Farm in more than a year. New form-change equipment was delivered to us at that time, but it performed perfectly for many months."

"How about unusual events? Did anything odd happen six months ago?"

"Nothing," answered the man. "There were automated deliveries to us, but that is usual. There were cargo shipments from here to the Harvester, as always."

"And there were—"

"No," interrupted the man. He reached out a hand, shielding the woman's eyes from the four visitors but being careful not to touch her.

"I must tell. Two of us are dead because we valued privacy above their lives. It must not happen again." The woman moved so that she could see Bey. Her voice was shaking. "Six months ago, some of us began to see things when we were out on the Farm. Apparitions. Things that could not be real."

The glass partition was beginning to darken, the lights to fade. "What were they?" asked Bey.

"Many things. Five days ago I saw a woman, many kilometers high and dressed all in red. She had long brown hair. Her clothes were the clothes of old Earth, and she carried a basket. She was striding across the collection layer, in ten-kilometer paces. She wore a white peaked bonnet, and beneath it her face was a face of a madwoman."

"A white bonnet, and scarlet dress?" Wolf jerked upright and reached out a hand. The partition was almost black. The ceiling lights were dim glows of red.

"No more," said the white-garbed man. His voice had risen in pitch and volume. "Our records will be available to you. You can see what came to the Farm during the last year, what was sent from it. You can read what our people saw. But there can be no more direct contact. Good luck."

"One more question," said Bey. He was moving urgently toward the black glass. "It's terribly important."

But the room was dark again. There was no sound from the other side of the wall.

* * *

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When the deadly strike came, each visitor to the Sagdeyev Farm was in a different part of the habitation bubble. Officially, it was to allow them to eat alone. In practice, each had deliberately sought privacy.

Bey had been dumbstruck by the Farmer's last words, to the point where he was hardly thinking at all. A brown-haired female, dressed in scarlet, carrying a basket and with a white bonnet on her head; that was his Mary, Mary Walton, exactly as she had looked in "The Duchess of Malfi." Bey had seen it in live performance five times, and in recording another dozen.

A coincidence of dress? If so, it was too improbable a coincidence for him to accept. But if *anyone* were to see such visions of Mary, it surely ought to have been Bey himself—not some reclusive Farmer, someone who had no idea what she was looking at. Bey sat with his head buzzing, too perplexed to feel hungry or thirsty. Somewhere on the periphery of his mind he knew that one of Aybee's comments on entropy was vitally important. Those ideas had to be integrated with the appearance of the Negentropic Man, and with elements of Bey's own knowledge of form-change theory. But that synthesis had to wait, until thoughts of Mary no longer obsessed him. The temptation to seek her was growing now, even though his idea that she was tied to events on the Farm was probably self-deluding.

Aybee Smith had not noticed that Bey was off in his own world, but it didn't take him long to realize that talking to Bey at the moment was a waste of time. Aybee went off to a terminal and tested the Farmers' offer. The final promise had been genuine; all the Farm records had been made available to the visitors. Aybee set out to make a chronology of every external interaction recorded in the previous year, and then to correlate that with the hallucinations and the anomalies in form-change performance. There were many hundreds of entries, but Aybee had lots of time. He never slept much, and if necessary he would plug along at the job for the next twenty-four hours. Like Bey, he relished intellectual challenge more than anything else in the world. He felt alert, fresh, excited, and confident.

Leo Manx felt none of those. He had been awake for two full days. He had hoped to sleep on the trip to the Farm, but Aybee had insisted on coming along; and then he had hardly stopped talking through the whole journey. The hi-probe quarters were too cramped to hide away, and Aybee was too loud to ignore. He had gone on and on about signal processing and signal encoding until Leo was mentally numb. Bey's hallucinations, according to Aybee, must have been single-frame inserts, patched into a general signal, but coded specifically to Wolf's personal psychological profile and comlink. No one else would notice the signal, even if they were watching the same channel as Bey. And it would be simple to make the single-frame inserts self-erasing, so even if Wolf tried to play them back on a recording, there would be no sign of them.

Now, at a time when Leo would have welcomed a nap, he couldn't get Aybee's latest comments out of his head. He rubbed at his aching temples, and stared at the notes he had made.

"The entropy of the whole Universe

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is increasing," Aybee had said. "But that doesn't mean that the entropy of everything in it must be increasing. In fact, life has the opposite effect. It increases regular structure—non-random phenomena—at the expense of disorder. Life is *always* negentropic. It reduces the entropy of everything that it comes into contact with. So *everybody*, and everything living, is negentropic in that sense."

"But the Second Law of Thermodynamics, the one you were quoting earlier—"

"—says that entropy tends to a maximum in a *closed, isolated* system. It tells you nothing about open systems, ones that exchange energy with others. That's us. We don't live in isolation. The Sun and the stars are constant sources of energy, and every living thing in the Solar System uses energy to create order at the expense of disorder. In the thermodynamic sense, you and me and the Wolfman and Fern are all negentropic."

"How about the other meanings of entropy? Do they make more sense for a Negentropic Man?"

"Considered in information theory, the information in a message decreases when the entropy of the signal becomes less. A noisy communications channel is negentropic, so far as the signal is concerned. If that's what the Negentropic Man does, we're not seeing signs of it. The reported random error rate for signals received in the Inner and Outer Systems doesn't seem to have changed at all. If it did, people would be getting jumbled, gibberish messages all the time. And if that had happened, I would have heard about it."

"And your fourth form of entropy?"

"That's associated with the power kernels. Any black hole has a temperature, an entropy, a mass, and maybe an electrical charge. If it's a kernel, a Kerr-Newman black hole, it also has rotational energy and a magnetic moment. And that's all it *can* have—no other physical variables are permitted. A kernel sends out random particles and radiation according to a process and a formula discovered a couple of centuries ago. What it emits only depends on the kernel's mass, charge, and spin. For a small black hole—billion-ton, say—the emitted energy is up in the gigawatt range. That's what the kernel shields are for, to stop that radiation. The entropy depends on the mass of the black hole, but I think we can rule out this one. If Wolf's Negentropic Man were dealing with kernels, he'd have to be a superman. Nobody could live for a second inside the shields. All you find in there are sensors, data links, and spin-up/spin-down equipment for energy storage and generation. Here." He had thrust a data cube into Manx's hand. "What I've been saying is all basic stuff. You'll find it explained there."

Leo had taken the cube. Sitting alone in an outer chamber of the habitation bubble, he had played it through twice. It was beginning to make some sense, considered as a set of abstract statements. But it had little to do with the capering man who had haunted Behrooz Wolf. Manx peered at the cube, closed his eyes for a moment or two, and was asleep before he knew he was near to it. All thoughts of entropy vanished. He dreamed that he was far from here, again on Earth, again roaming the old

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Chehel-sotun temple in Isfahan. But this time he was in free-fall, unhampered by that crushing gravity. He could not have chosen a more welcome dream.

Sylvia Fernald had the most need for total privacy. She was talking to Cinnabar Baker through a hyperbeam link. It was voice-only, hugely expensive to operate, and there was still an annoying thirty second line-delay before a reply could be received.

"You must return to the Harvester," Baker was saying. "All of you, and at once. There are developments here that dwarf the Space Farm's problems. How soon can you leave?"

"I'll have to go and tell the others." Sylvia replied immediately, but she could imagine Baker at the other end, chafing at the transmission delay. "So far as Leo and I are concerned, we can leave at once. But Aybee and Wolf are reviewing the Farm's data bases. That may take a while."

There was a pause that felt more like half an hour than half a minute. "You can't wait for that." It was the voice of command. "When you get back here, you'll understand why. Leave now, as soon as you can. I'll explain when you get here. One more thing: have you been able to get closer to Wolf?"

"Not in the way you mean." (But somehow I got turned on watching him eating. Would you call that progress?) Fortunately it was a voice-only link. Sylvia was sure her face would have betrayed her—maybe her voice was doing it, too. "I'll see what happens on the way back," she said. "But I'm not optimistic. I'm sure he finds me as revolting to look at as I find him. And Leo told me Wolf is still infatuated with a woman he left on Earth."

There was a final annoying delay. "He didn't leave her on Earth," said Cinnabar Baker at last. "She left him, to run off with somebody from the Halo. Big difference. Keep trying. Link ends."

New problems on the Harvester! What's happening to the Solar System, it's one damned thing after another.

Sylvia hurried out of the room. She was heading for Bey's quarters in the higher gravity region of the habitation bubble when the impact occurred.

CHAPTER THIRTEEN

No recording instruments on the Sagdeyev Space Farm survived the impact. The whole encounter had to be deduced from other evidence.

The object hit the southern hemisphere of the habitation bubble, close to the pole. It was a jagged brown chunk of the Primitive Solar Nebula, mostly ammonia and water-ice, and it massed about eighty million tons. With a relative velocity of a kilometer a second, it smashed clear through the bubble and emerged from the side of the northern hemisphere. It also missed by thirty meters a collision with the shields of the power kernel, and so failed to assure the immediate death of all humans on the Farm.

The momentum that the impact transferred to the habitation bubble did three things. It broke the bubble loose from the Farm's billion-kilometer collection layer. It left the bubble with a new velocity vector and a new orbit, sharply inclined to its old one. And it set the bubble spinning around the central power kernel as it caromed away into space.

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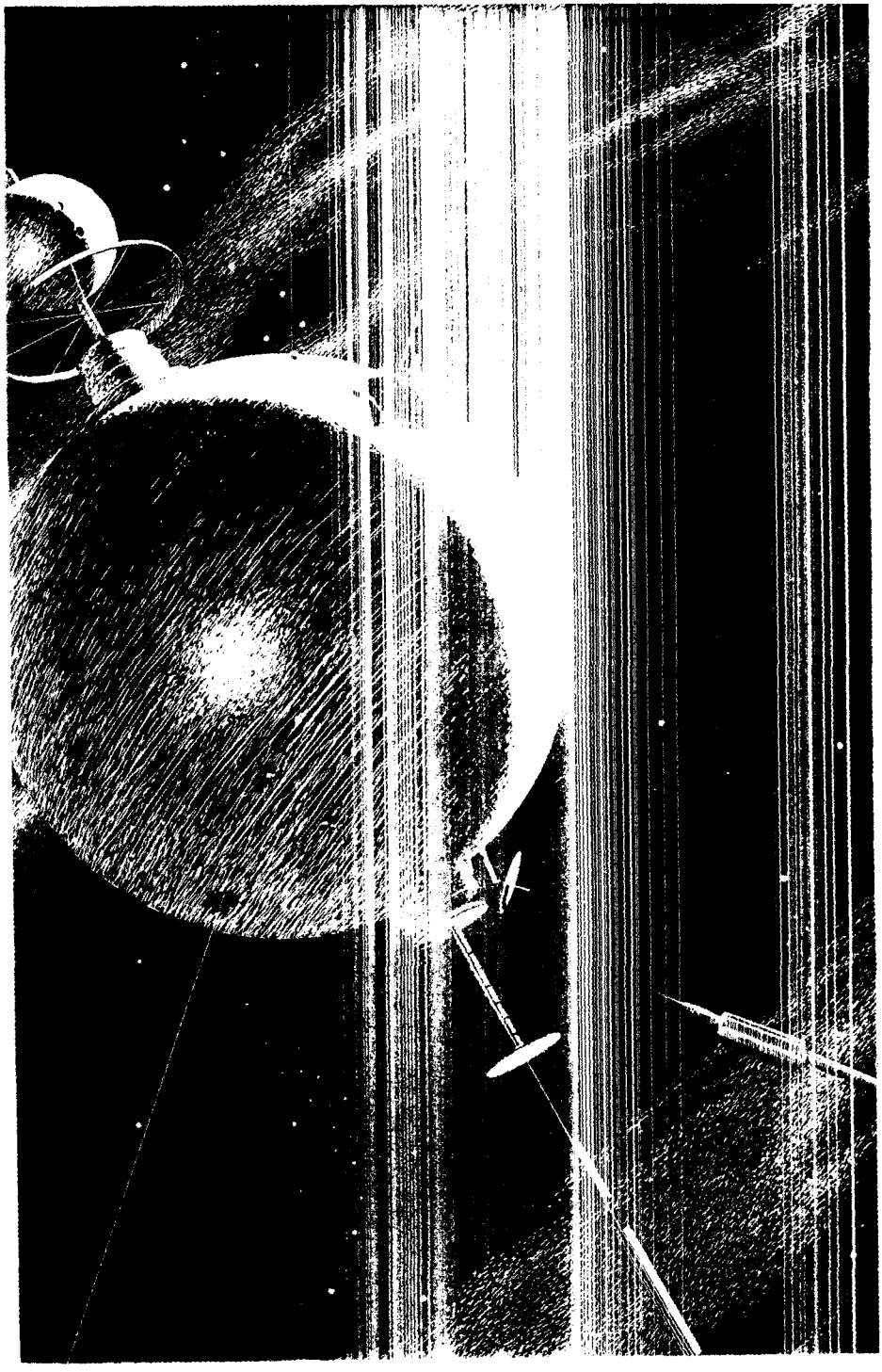

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Two thousand machines were left behind on the detached collection layer. After the first confusion they managed very well. The smarter ones herded the others into tight little groups, then settled down to wait for instructions or rescue. Whether that took place in one day or in one century made little difference. The smart machines knew enough to keep things under control for a long time. Not one of the two thousand was damaged.

The humans on the Farm were less lucky. Four of the Farmers were in chambers on the direct path of the intruding body. They died at once. Two others were left in airless rooms and could not reach suits. The rest of the Farmers followed the standard emergency procedure, and were into the lifeboat and clear of the bubble in less than a minute.

The visitors from the Harvester were both more and less fortunate. Their chambers were not on the main line of the collision, and the impact was felt at first as no more than a short-lived and violent jerk of acceleration. Leo Manx, Sylvia Fernald, and Aybee Smith did not know the emergency routines specific to the Farm, but they had been trained to react defensively. High acceleration of a habitation unit equalled disaster. They did not wait to see if the integrity of the bubble's outer hulls had been breached. As soon as they picked themselves up after the first shock of collision, they headed for the survival suits. They could live in them for at least twenty-four hours. Aybee had a mild concussion. Leo had five cracked ribs and a broken leg, but his deep-space training allowed him to override pain until he was safe in his suit.

Bey Wolf was in much deeper trouble. His room was closest to the line of destruction. Worse than that, he lacked the right reflexes. He knew there had been a major accident, but he had to attempt by thought what the others did by instinct.

He had been thrown headfirst and hard against the communications terminal. Drops of blood from deep cuts on his cheek and forehead were already drifting across the room when he came to full consciousness. His head was ringing, and he was nauseated. He wiped at his face with his shirt and staggered to the door. It was closed. Beyond it he heard a hiss of air, and he could feel the draft at the door's edge.

The sliding partition was tight-fitting, but not airtight. He had maybe a couple of minutes before the pressure dropped too low to be breathable. Just as bad, a faint plume of green gas was seeping *into* the room, and the slightest trace was enough to start him coughing. Wall refrigeration pipes must have ruptured. He might choke before he died of lack of air.

Suits. Where the devil where they kept? Bey hauled himself across to the storage units on the other side of the room. He jerked them open, one after another. Everything from chess boards to toothbrushes spilled out. No suit.

He caught another whiff of gas, coughed horribly, and mopped again at his bleeding face. What now? Where else might a suit be kept? Don't panic. *Think!*

He realized that if the data terminal were still working, it could tell him what he needed to know in a couple of sec-

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onds. He was moving across to it when the knock came on the door.

The sound was so unexpected that for a moment he did not react at all. Then he had a terrible thought. If someone out there in a suit were to try to come in. . . .

"Don't touch the door." He shouted it, but already his voice sounded fainter in the thinning air. Asphyxiation would get him, not poison gas. He was aware of the pain in his ears, and the cramping agony of trapped gas forced out of his intestines.

"Bey?" The cry from outside was muffled. It was Sylvia. "Bey, can you hear me?"

"Yes. Don't open the door."

"I know. Do you have a suit?"

"Can't find it."

"By the data terminal. In the foot locker."

He didn't waste air replying. The suit was there. But now he had to fight his way into it. He was growing dizzy, panting uselessly. He got his legs and arms in and pulled the suit up around his shoulders. But the helmet was too much. He concentrated all his attention on the smooth head unit, and managed to place it roughly in position. But he could not seal it. Anoxia was winning. The room was turning dark. At the edge of unconsciousness, Bey realized how much he wanted to live.

He was fighting the seals—and losing—when there was a crash behind him and a rush of escaping air. His lungs collapsed as the pressure dropped to zero. When Sylvia arrived at his side he was almost unconscious, still groping single-mindedly at the helmet. She slapped it into position and turned the valve. The rush of air inside the suit began.

She bent to look into the faceplate. Bey's face was a mottled nightmare of fresh red blood and cyanotic blue skin. As she watched, the oxygen-starved look faded. The chest of the suit gave a series of shuddering heaves. Alive. Sylvia grabbed Bey's suited arm and began to drag him. She had come here at once, as soon as her suit was on, and she did not know the cause of the problem. Another crash or explosion might happen at any moment. Like any Cloudlander, she fled for the safety of open space.

The exit wound of the colliding chunk provided the widest and easiest way out. Sylvia and Bey accompanied a mass of flotsam, flying out into space with the last puff of internal air from the bubble.

Bey was unconscious. Sylvia, shaking with exhaustion, held him tightly and looked around them. The collection layer of the Farm had been left far behind. The surviving Farmers had moved their lifeboat close to the shattered bubble, and half a dozen of them were preparing to reenter through an airlock. They had a clear duty toward their missing fellows: rescue, or space burial.

Sylvia could see the ship that she and Bey had arrived on. It floated a few kilometers clear of the bubble, apparently undamaged, its warning beacons a red glow against the stars. She was not sure that she had the strength to get there. She set out, dragging Bey along with her. When she was nearly there she saw a suited figure jetting across to help her. It was Aybee.

"Leo?" she said.

"Inside. Banged up, but not too

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bad.'' Aybee took over and hauled Bey along behind him. ''How's with the Wolfman here?''

''Hurt some.'' She was shivering. ''He should be all right. Where's our other ship?''

Aybee waved his arm through a wide circle. ''You tell me. The beacon's not working. I don't know how we'll ever find it.''

As he passed Bey through the lock, Sylvia took a last look around. There was no sign of the ship that Aybee had arrived in. It was lost somewhere in the darkness, indistinguishable from a million other pieces of stellar flotsam.

She collapsed as she stepped out of the airlock. In the past twenty minutes she had forced her body all the way to its physical limits. Any more help for Bey Wolf would have to come from someone else.

Bey woke up three times.

Pain was the first stimulus. Someone was hurting his face, stabbing again and again at his cheek and forehead. ''A bit crude,'' said a voice. ''But it'll do. Couple more stitches, I'll be all done. You're a mess. You hearing me, Wolfman? No beauty prizes for you.'' The sharp pain came again, followed by a wash of icy fluid across his face. Bey grunted in protest, and drifted back to unconsciousness.

The second time was more alarming. And more painful. He woke, and tried to touch his throbbing left cheek. He couldn't do it. Something had him firmly held, unable to move. He began to struggle, to pull randomly against his restraints. He was too confused and dizzy to analyze what was happening, or why, but he fought like an animal, straining as hard as he could. It was futile. He was working against straps designed to hold a human body secure under a ten gee acceleration. Exhausted after just a few seconds, he lapsed again to unquiet sleep.

Pain and consciousness came faster the third time, and with them—at last—vision. He was lying with his eyes open, staring at a woman's face. It was only inches away from him, pale and still. There was a tracery of blue veins on the temples, and the violet-black smudge of deadly fatigue below the closed eyes. He studied it, puzzled by its familiarity. Who was she? That rounded brow was well-known to him. He tried to lift his arm to touch the delicate skull and the fine red hair. He could not do it. They were strapped side by side, lying on a single narrow bunk and securely held in position.

As he placed his fingers on the release mechanism of his harness, awareness returned. And with it, fear. He remembered. Violent impact. The panicky hunt for a suit. The fight for air. Sylvia's appearance at his side, just as that fight was lost.

He had a vague, surrealistic memory then of the nightmare ride through space, stars blurred points through a bloodstained vizor.

''Sylvia!'' She did not move.

Bey struggled free and sat up. He was again on the transit ship, and the McAndrew drive was on. They were moving with an indicated acceleration of a couple of hundred gees. He was lying in the same bunk with Sylvia Fernald. On the other bunk, strapped in and wrapped like a cocoon from neck to

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ankles, lay Leo Manx. As Bey straightened up, Leo's eyes rolled towards him.

"Where's Aybee?" said Bey.

"I don't know. But the last time I saw him he was all right." Leo turned his head, slowly and gingerly. "It is Sylvia I have been worrying about. I cannot move, and I cannot see her monitors. How is she?"

Bey scanned the condition sensors, supplementing that with his own touch to her cheek and forehead. "Out cold, but everything shows normal. What happened to her?—and to you, too. And where's Aybee? And where are we heading?"

"Mr. Wolf, I am sure you can ask more questions than I can answer." Leo Manx's silky voice was gruffer. He was either in much pain, or terribly ill-at-ease. "I'll do my best. Sylvia Fernald made a supreme physical effort when she saved you, but it was too much for her. She collapsed as she reached the ship. At my suggestion and with the medical system's concurrence, Aybee extended her natural period of unconsciousness. She should sleep until we are close to the Marsden Harvester—our planned destination, where we should now find Cinnabar Baker. What was *not* my suggestion—" Leo Manx grimaced, with displeasure and then with pain "—was the idea that I would be bound here like an Egyptian mummy, unable to release myself. If you would be kind enough to free the harness. . . ."

"What happened to you?"

"Broken ribs, and broken legs. Aybee exceeded his duties and his authority when he anesthetized me, and then did this."

Bey moved to examine the telesensors for Leo Manx, spent a few seconds with the displays, and shook his head. "Sorry. The monitors agree with Aybee. You stay like that until it tells me something different. You should not move."

"Mr. Wolf, I assure you that I am quite able to—"

"Don't take my word for it. Try a deep breath." Bey watched, as Manx tentatively inhaled, and gasped with pain. "Case closed. What about Aybee?"

Manx rolled his eyes toward the tiny console crowded against the cabin wall. Everything on the transit ships was a third of the usual size. "It was my expectation that he would be with us on this ship. Clearly, he is not. But according to the signal there, a message is waiting for us. I have been looking at the indicator for some time, but unfortunately I cannot reach it."

Bey went across to turn on the unit. As he did so he saw his own reflection in the display screen. Whatever Aybee's talents, plastic surgery was not one of them. Bey's face and forehead were criss-crossed with crude, ugly stitches, and the skin on his left cheek had been pulled down so far that the red socket of his eye was exposed. There was no chance that such a mess would heal cleanly. He would have to use one of the Cloudland form-change tanks.

He switched on the set.

Aybee's image showed no sign of either excitement or injury. He scowled out of the display like a bad-tempered baby. "I don't know which of you will be watching this, but hi. If it's you, Leo, I didn't lie to you. I intended to come along as well. But the ship was awful

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crowded once I had you in your bunks, and with those ribs I knew you wouldn't enjoy anybody cuddling up close to you, the way Sylv and the Wolfman were doing last time I saw 'em. So." He shrugged. "I had to change my mind. And I haven't found any trace of the other ship. I'll look again, but if I'm delayed getting back there, don't be surprised. Here's a few things for you to chew on. First, the female Farmer we talked to. She's dead. We'll never get any more about that woman she saw walking on the collection layer. Second, the Farm can be saved, but the data banks are shot. So you should drop the idea that we can correlate the form-change problems with events on the Farm and the collection layer. I was doing that when the bubble was hit, and I'll tell you the only thing I'd noticed. The form-changes starting to go wrong coincided with a doubling of energy use on the Farm. That fact's for Wolf—you there, Wolfman?—and I hope you can make more out of it than I can. Bet you can't, though. Here's my last thought, and it's for anybody who wants it. From all I can tell, the bubble was hit by a Cloud fragment, one that was traveling unusually fast and from an unusual direction. Bad luck, you say?—except that the Farm had sky-scanning sensors, and the bubble had a standard response system. That fragment ought to have been given a little laser nudge when it was millions of kilometers away, and missed us by a nice margin."

He smiled from the screen, a humorless grin. "Now, I know what you're thinking, Leo. It's old paranoid Aybee, at it again. But try it on the Wolfman—he thinks more the way I do. And while he worries that, here's one more thing for you. The equipment that protected the Farm from space junk is the same type as we use on all the Harvesters. Foolproof, triple-tested, infallible. If the Farm can get hit, so can anything else. Nice thought, eh? Sweet dreams, you three. Think entropy."

The screen blanked. As it did so, the system alert inside the ship's cabin sounded its warning beep. They were close to crossover, the place where the ship rotated through a hundred and eighty degrees and they changed from acceleration to deceleration. For that thirty seconds they needed to be strapped in.

Bey headed for the bunk, lying down again alongside Sylvia. As he did so, Leo Manx gave a gasp of irritation. "Mr. Wolf! Don't let it do that."

A spray syringe was creeping out of its holder above Manx, and quietly positioning itself close to his neck.

Bey paused from his strapping-in and checked the monitors. "Don't worry. It's only an anesthetic. Apparently the robodoc thinks you're being too active."

"But I have no wish to go to sleep, Mr. Wolf. Stop it!"

"Sorry. Can't disobey doctor's orders." Bey lay back on the narrow bunk, squashed up next to Sylvia Fernald. He watched as the spray mist passed painlessly through Leo Manx's skin, and as the other man fell asleep in mid-protest.

Bey liked Leo, and enjoyed talking to him. But at the moment he needed time to chew on what Aybee had said. If he had been allowed one guess as to something that might correlate with the

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deaths in the form-change tanks, he would have picked sabotage—something in the software on the Farm's central computer complex. That fitted the idea that feedback information was being tampered with, or supplied incorrectly. What he would never have picked, in a hundred guesses, was the Farm's total energy load. In fact, he could see no way that it *could* be involved.

He felt fully awake. His aches and pains were unpleasant, and there was a disturbing buzzing in his ears. But he could stand that. He lay back in the bunk, ready for a long, intense session of thought. By the time that he saw the anesthetic syringe at his neck it was too late.

"Hey! No. I don't need—" Like Leo Manx, Bey fell asleep in mid-protest.

Bey had checked Sylvia's condition, and Leo Manx's, but not his own. He believed he was doing fine. The transit ship's computer disagreed. It knew that Wolf should be safely asleep and resting, but it also understood that he was unlikely to obey a computer command. The machine had waited impatiently for crossover knowing that Wolf would then have to return to his bunk. Now, satisfied once more with the physical condition of all three passengers, the computer turned to other matters. At its direction the speeding ship passed through point, and raced on for the second half of its journey to the Marsden Harvester.

The computer was justly proud of its performance. It encountered hardware problems so seldom that the automatic error-correcting codes were called on only a couple of times a year.

Error checking and correction was completely automatic. No human realized it, but the ship's rate of signal error generation was less than a thousandth of that of the computers on the Marsden Harvester—and less than a millionth of the rate for the now-destroyed computer on the Sagdeyev Space Farm.

CHAPTER FOURTEEN

"War is nothing more than the continuation of state policy by other means."
—Karl von Clausewitz (1780–1831).

"A thermonuclear war cannot be considered a continuation of politics by other means. It would be a means to universal suicide."
—Andrei Sakharov (1921–).

Conflict between the Inner and Outer Systems was a battle between a cat and a kestrel, between a lion and an eagle. Each could hurt the other—perhaps fatally. But neither could possess the other's territory, nor rationally want to do so. Fifty million people might annihilate twenty billion, but they could never subjugate them. No sane Cloudlander desired to live crowded into the Sun and the inner planets. And despite their enormous superiority in numbers, twenty billion could never control the sparse and infinitely dispersed inhabitants of the Cloud, constantly drifting outward, always farther from the Sun. No member of the United Space Federation could stand the cold, open space of the Cloud.

War was senseless. And yet war came creeping steadily closer. Its presence could be seen and felt, in the angry faces

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of people on the Harvesters, in the hoarding of food supplies and metals, in the false confidence and self-righteousness of the government speeches, and in the tense warning notes that flew between the Inner and Outer Systems.

Cinnabar Baker felt it better than anyone. She was officially responsible for the operation and maintenance of the Harvesters, but that position carried an additional duty as head of System Security. It made Baker, the most junior of the three people who ruled the Cloud, also the most powerful.

A couple of thousand staff members on her payroll sent back official reports from locations in the Cloud. Twice that number, scattered through the Inner System and the Halo, provided Baker's unofficial information network. If someone sneezed on Ceres, and that sneeze might mean bad news for the Cloud, Cinnabar Baker wanted to know about it.

Bey Wolf had watched the big woman in action, and asked himself, what makes Cinnabar run? The easy answer was the official one. She worked enormously hard directing the Harvesters, and that work gave her satisfaction. But the innermost depth of Cinnabar Baker, the invisible place where the ego is so delicate that a feather's touch will bruise it, lay elsewhere. She loved and cherished her secret security operation. The network was her eyes and ears. She would do anything to keep it in place. Yet even that was not her secret pride.

When word drifted in through the grapevine of an impending disaster at the Sagdeyev Space Farm, she could not compromise her sources. There might be a chain of a dozen informants involved, each with his own unreliability quotient, and each with his own cover. Every one had to be protected. No details had been available, no statement of how or when an "accident" might be expected. Cinnabar Baker had a choice: she could ignore the rumblings of her own intelligence net, or she could recall Leo Manx and the others from important work.

She had chosen to send that urgent recall message, but the news of the Farm's destruction had not yet reached her. The Farmers were too reclusive a group to offer frequent messages. Silence was not significant. She had no way of knowing that they were now struggling to devise a makeshift communications link from the remains of the old one.

Baker had the habit of returning to her office after the evening meal, clearing her desk and starting in again to work as though it were the dawn of a new day. She had arrived at the Marsden Harvester only that morning, but now, at an hour when most humans were settling in for their three or four hours of sleep, she was beginning to sieve through the mass of printouts of the day's incoming messages.

She had three types of informant. There were the ones she had carefully planted over the years, reliable Cloudlanders who knew what she needed and who understood how to screen important information from rumors and rubbish. Baker took any inputs from them seriously.

The paid informants were another matter. Loyal to no one, they tended to send her any old rubbish, hoping that it might somehow be worth money.

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Their inputs had to be looked at hard, and almost everything was discarded or given little weight.

Then there were the revolutionaries. Small groups within the Inner System were working for the overthrow of their own government, and they were willing to form alliances with the Outer System in order to do it. They provided information free, and would be outraged at any suggestion of payment. Cinnabar Baker worked with them, and used their inputs. But she had no illusions about their value. Most of her informants on Earth or Mars preached the overthrow of the United States Federation, but they would never live in the Cloud or the Halo. Worse than that, they saw every event through the distorting lens of their own paranoia.

Cinnabar Baker had inspected Bey Wolf very carefully during their first meeting. Wolf's reputation for intelligence and insight was extremely high. But Leo Manx had told of a self-destructive, hallucinating man, obsessed with a former lover. That fitted the pattern of an Inner System paranoid, one who might someday be converted to form part of her recruited group of unpaid informants.

She had dropped that thought in the first fifteen minutes of their meeting. Wolf was too strong and too sceptical, too cold and analytical. He could not be manipulated in the usual ways.

But there were also unusual ways. At the end of that first meeting, Cinnabar Baker had set a high-priority trace on the whereabouts of Mary Walton. So far, she had two things. The first was a recent poor-quality photograph of Mary Walton standing with her arm around the waist of a stern-faced man. Even in that faded image, his eyes were the commanding orbs of a fanatic, blazing out of the picture. Scribbled on the back of the photograph were the coordinates of a location in the Kernel Ring, accompanied by a question mark.

Those coordinate strings had been noted as a place for future investigation, but not as a high-priority item. Baker had no idea how she might use any information on Mary Walton, but patience and foresight were two of her main strengths. She would never admit she was willing to work with anyone and anything to achieve her goals, but she would have found it hard to name a group she would reject.

Tonight there were ninety messages for her review. Half of them came from official news reports, the rest from her own network. With Turpin crooning on her shoulder, his black head bobbing or tucked away under one shabby wing, she set to work.

Outer System first—she was not naive enough to believe that informants were needed only for the Inner System and the Halo. Most messages were simple statements of production or equipment problems. She skimmed through them, doing no more than confirm that the pattern of the past year was still present. The Outer System was going to hell. Navigation systems were failing, cargo transit vessels from the Inner System did not arrive, power systems were unstable or running close to failure, Harvesters failed their quality control tests, communications were suffering inexplicable glitches, and cargo packages that dropped Sol-ward from the Cloud were disappearing on the way.

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Aybee had done an analysis for her, and confirmed what she knew instinctively. What they were seeing was far outside the limits of statistical reasonableness.

In the minds of most of the Cloud's population, that left only one possibility: sabotage. And as the only instigator, The Inner System. Cinnabar Baker did not agree at all. She had her own ideas as to what was going on, and who was causing the trouble.

"But it's *how*, Turpin. How can Ransome affect all the control systems? That's the problem; and no one can help me with that."

The crow made a rattling noise like a set of bone dice being shaken, and stared at the sheets of paper with head to one side. "It's a bugger," it said solemnly.

"Indeed it is." Baker turned to the reports on the Inner System. The profile there had been slower to develop, lagging the pattern in the Cloud by a year or two. Now it was unmistakable to anyone who had watched events closely in both regions. It was the same story of inexplicable failure. Transit ships were disappearing, massive food shipments were failing to arrive on schedule, power supplies had become unreliable.

And the Inner System was reacting in a predictable way. They were blaming the Outer System. There was anger, and talk of sabotage, and threats of reprisals.

Cinnabar Baker could identify three people in the whole System who knew that the Inner and Outer Systems were not sabotaging each other. She was one. Her counterpart in the Inner System, a man whom she respected enormously but whom she had never met, was another. The third was the person who was causing all the trouble.

More and more, the lines of evidence converged on the Kernel Ring, and on the shadowy No-man's-land of Ransome's Hole. She was feeling her way towards its location, but her informants in the Ring had a habit of cutting off contact without warning. She had lost half a dozen in a few months. Her adversary seemed to know everything she did, as soon as she made up her mind to do it. She had looked unsuccessfully for the leak in her own operations. She continued her efforts, assembling fragments, pulsing her web of informants; but she was still a long way from a set of coordinates for Ransome's Hole.

And when she had them, what then? It was not clear that a direct attack would succeed—or if it did, that the sabotage would cease. Baker sighed and rubbed the poll of Turpin, still quietly watching her flip the pages.

"Come on, crow. We've earned a break." She set down the listings and wandered off toward the door, the bird still gripping her shoulder. It was the middle of the quiet period, and every rational person was asleep. Baker met no one as she padded barefoot along half a mile of silent corridor.

As she opened the crèche door, the sounds began. Forty babies were crying, fifty more gulping and grunting as they were fed by the machines. Three hundred others were sleeping peacefully. The solitary human attendant was lying down at the end of the room, eyes closed.

Cinnabar Baker did not wake him. She did not want conversation. When she arrived at any Harvester, an unheralded visit to its crèches was a high

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priority. To her, it was the heart of the world. She had never found a habitat where things were going well in the crèche, and badly elsewhere.

She watched and listened for twenty minutes, walking along the aisles and occasionally picking up and holding one of the babies. They ranged in age from two days to two months. One new-born had been placed in a form-change tank for remedial work on a deformed limb. Baker peered in through the transparent port and checked the progress of the change. It was normal. She made a mental note to return in three days to make sure the outcome was satisfactory.

She checked the instruction monitors above each crib, noting the frequency and duration of the parents' visits. Finally she was satisfied. She stole away, rejuvenated, ready for hours more of tedious work.

The government of the Inner System knew Cinnabar Baker as a powerful, formidable woman. They would have been little comforted to know that she happened to be sterile. She was the biggest threat to their independence and way of life.

Perhaps they were right. But if so, it was only because she could sense full-scale war looming closer and closer. Cinnabar Baker saw herself as the secret mother of the whole System. Her children could not be allowed to fight each other, to kill each other. She would prevent that—even if the whole System had to be under her control before she could stop them.

To an inhabitant of Earth, all the Harvesters were the same. They were remote, identical food factories, run by soulless machines and populated by a thin sprinkling of people.

Bey was beginning to learn the truth. Each Harvester was different, as different as the separate planets and asteroids of the Inner System.

It had begun the moment they left the first airlock. He had been swathed from head to foot in flowing hospital robes that left only his eyes showing, strapped to a stretcher, and maneuvered swiftly inward from the surface. The sounds began in the first interior corridor. The Opik Harvester had been eerily quiet, but this habitat was filled with music, lush instrumental pieces that had not been heard on Earth for centuries. Each concentric set of chambers blended harmoniously into the next, even though the same work was never played in both.

Bey looked for the source of the music. It was invisible, projectors hidden behind the luxuriant green plants that climbed restlessly over walls and ceilings. He recognized them. They were an adaptation, a variant on the free-space vacuum vines popular in the asteroid belt.

And then there were the people. The ones he had met on the other Harvester had been furious—angry at the Inner System in general, and at Bey in particular. They resented his presence, enough to want to fight him.

The Marsden Harvester's population did not show rage. They stank with fear. The people he saw as he was hurried through the corridors gave him not a second look. They were afraid, preoccupied with other matters, and most surprising of all, many of them were sick or deformed.

"I've never seen anything like it,"

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said Sylvia, after they had moved past a group of agitated people. "This is the oldest of the Harvesters, and usually it's the most peaceful. They're all scared."

"They look terrible."

"They do." She turned to face him. "And so do you. Those cuts on your face are bleeding again. I'd take you right to the form-change tanks with Leo, but Cinnabar Baker wants to see you first."

"It's mutual." Bey had been brooding over one fact since he woke in the transit ship. According to Sylvia, it was Cinnabar Baker's order for an emergency departure from the Space Farm that had given Sylvia enough lead time to save them. "I have a question for Baker."

They had left the clean, open corridors of the Harvester's periphery, and were plunging on towards the center of the main sphere. This region had been built before mastery of construction without metals had been fully achieved. The vines were absent, and the chambers were shabby past hope of disguise. The walls sagged inward, the floor was wrinkled and blackened, and hair-like outgrowths of hydrocarbon filament blurred the clean outline of lighting units and ventilators. To Bey it was oddly comforting. It reminded him of Earth's familiar run-down cities.

Cinnabar Baker's apartment was the one point of constancy. It was identical to the bland chambers that she had occupied before, with plain furniture and drab beige walls. Turpin perched on the back of a chair, as dusty and dishevelled-looking as ever. The crow greeted the newcomers with a sinister muttering.

"Don't mind Turpin. He's been in a bad mood since we got here." Baker took a hard look at Sylvia, then at Bey's mangled face. She gestured to the grey chairs. "Ten minutes, Mr. Wolf, that's all I need. Then we'll get you to a form-change tank for remedial treatment—if you still want to go there."

"More problems?"

"And worse ones. Did you meet any people as you came here?"

"Dozens of them."

"So you know how they look. Do you know what's wrong with them?"

Bey shrugged. "Obviously they're not using the form-change tanks. And some of the people I saw appeared old. They need treatment—soon."

"You didn't see the worst cases. The population of this Harvester has the highest average age of any group in the Outer System."

"Then you have an emergency. Some of the people I saw won't last more than a couple of weeks. Why won't they use the tanks?"

"They're afraid to." Baker passed a card across to Bey. "Those are the statistics for the performance of form-change equipment on this Harvester. I headed here as soon as I saw the figures. We're facing a ten percent failure rate—many of them leading to death. Some of the units are going wrong three-quarters of the time, and the results are hideous. People won't go near a tank, and it's hard to blame them." She frowned at Bey. "Mr. Wolf, why are you smiling? There is nothing funny in this."

"Sorry." What Bey was feeling was not humor. It was relief. "If I was smil-

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ing, it's because I can finally do something to justify my presence."

"Do you know what's wrong?"

"Not yet. But I will in a few days." Now both women were staring at him in perplexity. He realized that a smile on his stitched and battered face must be a gruesome sight.

"What we faced before were intermittent faults," he went on. "One in a million faults. That kind are almost impossible to track down. You can set up test procedures, and observe for years, but you may never run across anything wrong while you're actually watching. Now we're in a different situation. I can set up monitors on a few tanks, and be sure I'll find something on at least one of them in a reasonable time. Give me a day or two."

"Can you correct the problem?" Baker's face showed her own relief. "I know it's early to ask that, but we need to tell people something."

"If I can find it, I can fix it. And I'm pretty sure I'll find it."

"How?" Sylvia looked at Baker. "I don't want to be the pessimist, but we have to know how he does it. Bey has to go into a form-change tank himself in a little while."

She was *worried* about him. Bey Wolf's surprise was genuine. He had lived with form-change equipment for so long, it had never occurred to him that someday he might die with it. In this one area he was completely confident. "I'll tell you just what I'm going to do. It's no big mystery, and once you understand it, you can do it, too. I'm sure the form-change problems are software, not hardware—we established that on the Space Farm. We'll use a diagnostic program that exits the form-change program after every major step, and performs a status check. When we find a software inconsistency, we run a ferret routine to trace it back to the block of instructions that produced it."

"Is it easy?"

"It's routine. It's exactly what BEC does when they are testing a radically new form. I'll show you how it's done. But before we do *that*—" Sylvia was standing up "—I have a request."

Cinnabar Baker nodded politely. Bey knew that she would have preferred him to get right down to work on the form-change process.

"You sent Sylvia an urgent message, telling us all to leave the Farm," he said. "Why did you do that? If it was just to get me back here to look at form-change problems, why drag Aybee and Leo Manx back, too? They still had things to do on the Farm."

"Mr. Wolf, if you ever tire of the Inner System, there is a position for you in the Cloud." Cinnabar Baker nodded slowly. "You are very astute. I had a warning—a tip-off—that something bad was going to happen to the Farm. The Farmers themselves would ignore any request to leave, but it would have been criminal to leave the four of you there without warning."

"You were told that we were all in danger?"

"No. I was warned on your behalf, specifically. It was my conclusion that you were all at risk."

"Who told you? I suppose that you have a network of your own—people who serve as your informants, pass on to you rumors and gossip."

Sylvia looked uneasy at his comment,

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but Baker nodded again, her manner relaxed. "I do. Naturally, it is not something that we advertise."

"Does it work both ways—to *spread* information and questions through the System, as well as collecting answers?"

"Only too well." Baker paused for a moment, looking around her. "It may be happening now. I am not the only one who uses informers. Secret information leaks from my office so quickly that others often seem to know it before my own staff."

"That's fine. I want something spread as widely as possible, and I want it spread as a rumor."

"It can be done. What is it, Mr. Wolf?"

"I want you to get out the word that I was killed in the accident on the Sagdeyev Space Farm."

"Easy enough to do. But why do you want it?"

"Protective paranoia. Someone was after me when I was on Earth, trying to drive me crazy. I think they were still after me on the Farm—it's a self-indulgent idea, that someone would arrange to destroy the whole Farm just to get me. But I believe it, and I think you do. If they know I'm here and still working for you, they'll keep trying. The safest person is a dead man."

"Dead man," repeated Turpin in a sepulchral whisper. "Dead man." He walked along the back of the chair and peered at Wolf with bright, beady eyes.

"Very well." Baker nodded, but Bey could see the doubt on her face. Was she continuing his own train of thought? If it were improbable that someone was seeking to end Bey's life or destroy his sanity, their continued failure was even more improbable. He had been too lucky. And it opened again the question as to why he was worth killing—or worth saving.

In his dog days at the Office of Form Control, Bey had sometimes thought of the detection of illegal forms as a vast game of chess. In that game he was the master player, one who controlled the movement of people and equipment on a giant board that spanned the space from Mercury to Pluto. It was a game that he had never lost.

Now another game was being played, on a much bigger board and with higher stakes. This was a battle over a territory that ranged from the Sun to the edge of the Cloud, one that stretched a quarter of the way to the stars, a new game that was spreading panic and anger and threat of total war through the whole System. And this time, Bey himself was nothing more than a pawn.

CHAPTER FIFTEEN

A Kerr-Newman black hole, or kernel, *charged and rotating, is a highly dynamic object. The rotational contribution to its mass-energy can be extracted (or added to) using the Penrose process, and the kernel's own electric charge can be used to hold it in position, or to control its movement from place to place. Thus, such black holes are "live"; they can provide energy to or remove energy from their surroundings, in a controllable way, and they can be placed at any desired location. They are* power kernels.

A Schwarzschild *black hole is a kernel that is neither charged nor rotating. It is a kernel in a debased and limiting form, a spherically symmetrical object*

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that has lost all electric charge and rotational energy. It is "dead," in the sense that one cannot extract from it in a controllable way any of its mass-energy. Unless it is "spun up" (i.e. given rotational energy using the Penrose process) it is not useful for power production.

The Schwarzschild black hole is not, however, totally inert. Like any other kernel, it gives off particles and radiation from its hidden interior according to the Hawking evaporative process, at a rate depending only on its mass (smaller black holes emit more strongly than larger ones). However, the pattern *of this emission is predictable only in overall statistical terms. All events and processes occurring within a certain region about the center of any black hole, whether of Schwarzschild or Kerr-Newman type, are unknowable. The interior of the black hole within this "event horizon" constitutes, in some sense, a* separate universe *from ours.*

—from the 2011 centennial Festschrift volume, compiled in celebration of John Archibald Wheeler's one hundredth birthday.

Aybee was in trouble. He was smart enough to know it, and smart enough to realize he was unlikely to get out in a hurry.

His decision to remain on the ruined Farm had been perfectly reasonable. There was too little space for him on the transit ship; Leo and the others were in the competent hands of the ship's emergency medical system; and Aybee himself was not urgently needed back on the Harvesters. His offer to help the Farmers had been politely—and predictably—refused. While they were maneuvering the habitation bubble back into contact with the collection layer, Aybee switched to long-duration suit and went hunting.

He had two items he particularly wanted to find among the thousands of bits of debris created in the collision. One was the ship he had arrived in. It would almost certainly need repairs, but it might be his quickest way home when he was ready to leave.

With the help of the suit's microwave sensors he found it in the first twelve hours. It was floating a couple of thousand kilometers from the collection layer, with a small relative velocity. Aybee tagged it with a tracking beacon and went on to the harder part of his search.

The central computer of the Farm had been on the direct line of impact. Not even a trace of it was left. But there must have been backup storage for its records. It was in a region of the bubble that had been smashed open by the impact but not totally destroyed. Somewhere in the mess around the Farm Aybee hoped to find the secondary storage cube. It would be small, no bigger than his fist, and he had no illusions about how hard it would be to find it.

With so much debris of all shapes and sizes, the only hope of identification was through the data cube's reflectance spectrum. He selected the spectral signature for a data cube, set up a spatial survey for it, and settled down to wait. While the scan was being performed, he finally had time to look around him.

And to gasp.

If he had been less busy, he might have noticed it hours earlier. A dark

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oblong stretched across a quarter of the sky, hiding the bright starfield. He cut in his low-light sensors, and saw it at once as a massive cargo craft, drifting closer with unlit ports and with drive off. It was the type used to carry food shipments from the Cloud to the Inner System, a low-acceleration ellipsoidal hull over a kilometer long and six hundred meters across. It felt close enough to touch.

Aybee did not consider for one moment that it might be a rescue vessel. The approaching shape was too dark and lifeless. He floated himself across to a tangle of ruined cabin furniture and set himself in the middle of it.

The hulk approached within two hundred meters of the battered habitation bubble. A dark port opened, and a file of suited figures emerged. Their suits were bulky, ending in a characteristic flared and massive lower section. That solid base contained low and high thrust jets, power supply, food, air, and water recycling systems, medical facilities, exercise units, and communications equipment. At the wearer's command, the flared bottom would open out to a thin-walled twenty meter sphere, or couple with one or more other suits to form a common living volume.

Only one group used suits like that. Podders!

But these were Podders many billions of kilometers away from their usual haunts in the Halo. They were entering the dim-lit habitation bubble now, passing to the interior through the gaping hole near the South Pole. The bubble was on emergency power, but it was still far brighter than the dark cargo ship.

What was it doing here? It was inconceivable to Aybee that there was anything valuable left on the Farm, even including the machines and metals on the collection layer. And the Podders were showing no interest in those.

While he watched, another port in the cargo vessel began to dilate. This one was huge, an opening nearly forty meters across in the end of the ship nearest to the bubble. He stared at it, waiting for something to emerge.

It was completely free of the ship before he knew it was there, and then he did not see it. All he saw was a circling array of electromagnets. At their center sat a moving sphere of blackness, drifting slowly under their control towards the habitation bubble.

It was a kernel, totally shielded by electromagnetic baffles. At the center of that dark sphere sat a tiny, billion-ton, Kerr-Newman black hole, its fierce sleet of radiation and particles balked and turned back on itself by the triple shields. The kernel had been halted. It hovered, stationary with respect to the bubble, and waited. The bubble's own main port was opening. Finally a second sphere of aching black emerged from the gaping port, its position controlled by surrounding electromagnets.

Aybee watched in amazement as the two drifting spheres changed places. The shielded kernel from the Farm finally vanished into the cargo hull, and after a few minutes the new kernel was jockeyed into place by the bubble's port. It was nudged on down, into the interior.

Aybee was bursting with curiosity. He nestled down into the tangle of space junk surrounding him, and inched the

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whole assembly gently forward until he could see into the bubble's open port. He peered out through the mess of shattered furniture.

The kernel was replacing the one that had been removed. Aybee had noted the status of the Farm's power kernel when he and Leo Manx had arrived. It had abundant rotational energy and was nowhere near depletion. There was no sense in replacing it—unless the Podders needed power, and were swapping the kernel from the bubble for a dead one from their cargo ship.

It was a simple matter to test that idea. One look at the new kernel's optical scalers would tell Aybee what was happening, and that was a one minute job if he were next to its outer shield.

The port was closing, and now the Podders were leaving, one by one. As the final suited figure disappeared silently into the cargo hulk, Aybee headed for the bubble.

That was the exact point where Bey Wolf would have put his hand on Aybee's shoulder, told him to wait a moment, and asked a basic question. Where were the Farmers? But Bey was billions of kilometers away. Aybee left his shelter of ramshackle cabin furniture, and headed into the bubble along the gaping exit wound of the earlier impact.

The Farmers and their servant machines had accomplished wonders. Already the bubble's interior had been cleared of broken fittings. Makeshift bulkheads had stabilized the atmosphere of the interior and set up a new system of corridors that provided access to the habitable part of the bubble.

Aybee drifted down towards the bubble's center. The new kernel had been established there, in place of the original one. It had plenty of available energy—according to Aybee's recollection, almost exactly as much as the old one. The mystery was greater than ever. Why swap two identical kernels for each other?

He headed up a narrow stairway that would take him away from the kernel, and toward the bubble's outer surface. At that moment he learned that the Podders had not left permanently. Three of them waited in a tight group by an exit duct, while a fourth one was leading a group of three Farmers out of the bubble at gunpoint.

Aybee ducked back into the shelter of the stairway and reviewed his options. He could wait, hoping that the Podders were finally done and were all leaving. Or he could take more positive action, heading out through the entrance wound created by the impact of the ice fragment.

The disadvantages of both ideas were easy to catalog. His hiding place was completely exposed to anyone who wandered by, and the way down to the kernel was a blind end. If the Podders wanted to be sure they had all the Farmers, they would not overlook the surface of the kernel shields. On the other hand, he had no idea what might be waiting in the other direction. The Podders had first entered the bubble there, and some of them could be there again.

Bey Wolf would have waited. He was a great believer in putting off decisions, which he dignified as "keeping open all his options."

Aybee couldn't do that; he had too nervous a nature. After at most a minute he was hugging the side of the tunnel,

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and creeping away towards the surface of the bubble. He was careful to look at the way ahead, and turn every few seconds to make sure that he was safely out of sight of the four Podders behind him. He was doing that at the exact moment when a fifth Podder, also looking the other way, emerged from a narrow gap in the wall and ran right into him.

The suited figure didn't bother to speak. He waved the gun he was holding at Aybee, and gestured him forward.

Aybee could take a hint. He nodded, and moved off along the tunnel towards the outer surface. The radio silence he had been observing earlier now seemed pointless. Aybee scanned for the frequency the Podders were using and turned his suit to transmission.

"What are you going to do with me?"

The figure behind him grunted with surprise. Aybee realized it was a woman. "I thought you people didn't talk to anybody," she said. "None of your buddies said a word."

She thinks I'm a Farmer. But if I play that part too well, she won't tell me anything.

Aybee grunted. "We don't talk much. But this is an emergency."

"Don't talk much, and don't listen much either." The Podder sounded disgusted. "I'm not going through all that spiel again. Do as you're told, and don't give us any trouble, and you'll be well-treated. If you start cutting up, you'll find you're six to a cell."

The ultimate threat for a Farmer. Aybee didn't like the sound of it too much himself. He still had memories of the cramped trip to the Sagdeyev Space Farm with Leo Manx.

"Where are you taking me?"

"Are you deaf? Wait a minute." She moved around in front of Aybee and peered in through his faceplate. "I haven't seen you before. We didn't get you the first time through. Where were you?"

"Outside."

"And you came back in?" The Podder gestured him forward again. "Well, now I've seen everything. You were safe out in space, and you came back in. How dumb can you get?"

Aybee had three good reasons not to answer. First, he assumed it was a rhetorical question. Second, he had to agree in this case with the Podder's implied comment on his brains. He had been safe outside, and all he needed to do was wait for the Podders's ship to go away. Then he could have spent the next month inside the bubble, if that was what he felt like doing.

And third, he didn't need to fish for more information about the Podders' immediate plans for him. He could guess them. They were close to the great hulk of the cargo ship, and a hatch was gaping open. With the woman close behind, Aybee drifted on into the gloomy interior. He wondered how long it would be before anyone on the Harvesters even noticed he was missing.

CHAPTER SIXTEEN

"She did corrupt frail nature with
some bribe,
To shrink mine arm up like a
withered shrub,
To make an envious mountain on
my back

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Where sits deformity to mock my body;
To shape my limbs of an unequal size,
To disproportion me in every part. . . ."

Every emergence was different.

Bey came out of this one dry-mouthed, wobble-legged, and furious. He knew the form-change process better than anyone. He could tell when parameters had been changed from their original settings, even when he was the subject, and this time he knew he had been through a lot more than simple tissue restoration.

The door of the tank sprang open, and he looked out. Sylvia Fernald was sitting by the control board, staring at him.

He roared with rage, a horrible squeal of unfamiliar vocal cords. "What the hell have you been doing to me?" The ionic balance of his body was still adjusting, and the chemical rush of anger was strong enough to propel him forward out of the tank in one movement. "Don't try to lie, you've been meddling and you know it."

"You call it meddling when somebody tries to help you?" She stood her ground. "I've just saved you. You'd have been cut to bits as soon as people in the harvester knew you were here. No one from Earth is safe now."

"I can look after myself." Bey tried to gesture in anger, but his fist would not close. His body felt terrible, a bad size, a distorted shape. "A form-change like that—you could have killed me."

"I studied the change very carefully. It's a standard type of form for the Outer System."

"I didn't need a change."

"*Wrong!* You need a change. More than a change—you need a damned *keeper*. I've had it with you, and I don't care what Baker wants." Sylvia stood up. "You're an idiot, Bey Wolf, you know that? You come out here, an Earther, and you think you're God's gift to the Cloud." She gripped him hard by the arm, and pulled him along the room. He stumbled after her, still too weak to give more than token resistance. She halted by the door at the end of the room. "Take a look there. What do you see?"

Bey found himself in front of a full-length mirror. He was facing a nightmare, naked and thin as a skeleton, tall and stooped as a praying mantis. All the muscles had gone from his arms and legs, leaving ugly tendons and sticks of bone that ended in taloned hands and feet. His ribcage jutted like parchment drawn over a dry wooden frame. The hair was gone from his head and body, and his browless eyes glared demented out of hollow sockets. His hairless genitals looked vulnerable and ridiculous. He stood frozen, his skull-head mouth gaping open.

"What do you see?" She had gone on shouting at him, but he had not even heard her. "What do you see?"

"You did this to me!" He shook his arm loose. "You're insane. You've turned me into a monster. I've got to get back in the tank, make this right again."

"No!" She stood in front of him, blocking his movement, and he realized how tall he had become. They were suddenly eye to eye. "It's time you learned something, Behrooz Wolf—if you're

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still able to learn anything at all. I don't know what you see, but I'll tell you what I see, and it's the way everyone thinks in the Outer System."

She stepped back, and swept him from head to toe with a searing glare. As his anger had calmed, hers had grown. "I see a passable-looking man for the first time since I met you. A man I would be pleased to know, a man whose company I might even enjoy. Not a damned monkey. Not a squat, hairy toad. Not a hirsute, jowly, sun-sucking *midget* that no normal woman would be seen dead with. And *yes,* I did it to you. And *no,* I'm not sorry I did it. I sat by that damned tank for a hundred straight hours, to make sure nothing was going wrong with the change I keyed in. And *yes,* I knew what I was doing. And *no,* I don't expect you to appreciate it. You're too graceless, too selfish, too self-obsessed, too wrapped up in your self-superior idea that anything from the Inner System has to be good and right." She was screaming at him. "So damn you, Bey Wolf, if you want to get back into that tank, go ahead. I won't stop you. And I won't interfere when the people on the Harvester grab you and spill your guts."

Bey's body chemistry change was complete, and his condition was stabilizing. He was beginning to feel almost normal, but he also knew that the mood swings might be far from over. He stared fascinated at his image in the mirror, and shook his head. "I look like a form-change *failure.* Those legs—you actually *programmed* for those legs?"

"They're great legs."

"They're revolting. Look at them! Too short, too white, too bowed." He turned to face her. "You're serious, aren't you? You think I should thank you for this."

"You should go down on your knees and kiss my hand. My God, I was doing you a favor." She had stopped shouting at him. "You're supposed to have brains. Use them. You asked Cinnabar Baker to announce that you had been killed on the Space Farm, so you could explore the problem without people knowing who you were. How well would that have held up, when people saw you? You *had* to change. I suppose you thought that you'd blend right in with the rest of us, with your ridiculous Earth body."

"All right. But why didn't you warn me?"

"Would you have agreed to this body if I had?"

"Never." Now that he was not angry, Bey was feeling a bit guilty. She had sat by the tank for days, looking after him, and he could see how pale and tired she was. "But do you blame me for feeling that way? Would you have let me change *you,* so you looked like an Earth woman?"

"Don't be disgusting."

"Well, then. But I'll admit it, you're right about one thing, and I want to apologize for shouting at you. It's an odd thought, but in this stick-insect body I *will* be less noticeable here." Bey took another look at his reflection and grabbed for a robe by the door. It was suitably long and full—when he had it on he could see nothing but his hands and head. "That's better. I'd rather not see myself. But I still wish in some ways I could get back in the tank. I don't seem to be *done.*"

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"Are you feeling sick?"

"Not exactly. But I'm certainly feeling a bit Plantagenet-ish."

"A bit *what?*"

"You know. Or if you don't, you should." Bey held the robe tight around him, stood up as straight as he was able, and declaimed: " 'Deformed, unfinished, sent before my time, into this breathing world scarce half made up, and that so lamely and unfashionable, that dogs bark at me as I halt by them.' Richard the Third. One of my all-time heroes."

She stared at him. Finally she laughed. "My God, Leo was right. You *are* insane. You're worse than Aybee. Totally crazy."

Bey considered her statement. He was a bit light-headed, definitely that, but it wasn't his strongest feeling. "More like totally starving. Whatever you did to me, it left me hollow. Can I get some food?"

"We can try. And you'll have your big test. We'll see if you can pass—as a Cloudlander. Here, wait a minute." Bey was all ready to head out of the door. "You'll never pass in that outfit."

"You all seem to dress the same. There must be a uniform near."

"Wrong again." Sylvia gestured at her own grey suit. "I'm still just the way we came off the ship, but I wouldn't dream of mixing with other people here like this—or in the old uniform. You seem to think all the Harvesters are the same. They're not alike, any two of them, in either their layout or their people. This harvester is super fashion-conscious. Nobody here would be seen dead in those yellow suits we wore on the Opik Harvester. If we want to be inconspicuous, we have to follow local ways. Come with me. It's right next door."

The room she led him to had rack after rack of clothing—gaudy, varied, and extreme. Bey hesitated, then shrugged. "I've no idea. You know how to make me blend in. Pick something."

Within two minutes she had selected a pair of skintight peacock-blue suits with matching footwear and tall egg-shaped hats. They seemed designed to make Bey look even taller and thinner, and were in his opinion the most ridiculous outfits he had ever seen.

He stared in disbelief at his reflection. "We can't go out in public like this. Everyone in the harvester will laugh at us."

"They won't even notice. Not in this harvester."

"But the people we saw as we came in from the ship didn't look like this."

"They were maintenance and operations crews. In uniform. You wouldn't know them if you saw them off-duty."

Bey started for the door, then paused for a last look in the mirror. "Are you *sure?*"

"Trust me. You look quite handsome." Sylvia tucked her arm in his, and led the way. "Remember, until you get the hang of that body in low-gee, you let me set the pace. Pretend we're a couple. Don't talk much at first, and if you don't know how to move, just let me drag you along."

They set off along a mysterious zigzag of corridors and stairways. Bey knew he was lost within one minute; in ten minutes, he knew why the Cloudlanders had picked their preferred forms.

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He was shaped just right for a low-gee environment. He could pivot his top-heavy body around its center of mass, and use his long arms to control the direction of his movement, unhindered by excess muscle or fat. Even the air somehow smelled better now, but whether that was his new physiology or his imagination he could not tell.

The hall they came to was crowded for a room on a harvester. Bey's initial worry, that this was too public a first appearance for his new body, vanished when he saw the general behavior. A peculiar sense of panic and excitement filled the air. No one took any notice of Bey and Sylvia. A couple of hundred noisy people were milling around a dais at one end, and as Bey looked at them he felt reassured. He was one of the most conservatively dressed. Pink sequined pantaloons and curved-toe slippers competed and clashed with scarlet tunics and glittering black hose. Earth-taste was non-existent.

At a gesture from Sylvia, Bey slipped into an eating cubicle at the back of the room. Sylvia in the next cubicle was out of sight unless she stood up to look over the partition, and one-way glass in the front wall allowed both of them to see the rest of the hall. Most of the crowd was clustered around a scarecrow of a man with a blue skullcap, a long white robe, and a mask that covered the lower half of his face.

"You have a choice!" He had a muffled, booming voice, echoing from the room's bare white walls. "I can *give* you a choice. If you do not like the idea of form-change, if you do not care to face the terror of the tanks, *there are other ways*. Ancient secrets, the mysteries of Earth's antiquity, means of treating illnesses that do not depend on the use of form-change tanks."

"Nothing good comes from Earth!" The shout came from somewhere in the throng of people.

"From today's Earth, you are right." The man on the platform turned to that part of the crowd. "I think we ought to destroy Earth, and all the Inner System." There was a roar of approval from the crowd. "But that does not mean that the knowledge of old Earth is useless. All our ancestors once lived there! I have learned Earth's old secrets."

Bey spoke to Sylvia, busy ordering food in her cubicle from the table server. "What's he talking about?"

"I was going to ask you the same thing. He said something about knowledge coming from ancient Earth."

"The distilled wisdom of long-dead ages," the booming voice was continuing. "Three hundred years ago, the knowledge that I possess was tightly held by a small group of people. When form-change came in, the need for their skills disappeared. They lost their power. Their special learning vanished. But not forever! By intense research, I and my assistants have repossessed those lost skills. We are the New Aesculapians." He held up two clear bottles, one filled with a cloudy green liquid and the other filled with small white spheres. "Whatever your ailment, we can help you! One of these will be the answer."

"Oh, my God." Bey had been chewing on a bland yellow wedge of material that Sylvia had ordered. Now he almost choked, and spoke with his mouth full. "I never thought I'd see this."

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"What is he offering?"

"Pills and potions. Panaceas. He's saying he's a doctor!"

"You mean a—a *physician?*" Sylvia groped for the old word. "There are no such people in the Cloud."

"Nor on Earth, any more—there hasn't been for two hundred years. I didn't think there ever would be again, anywhere." Bey was ecstatic. "Before purposive form-change was developed, there were thousands of them. They were enormously powerful, just like a priesthood. Those clothes and masks he's wearing were their robes. I wonder he isn't spouting the Hippocratic Oath and writing prescriptions."

"Writing *what?*"

"Purchase approval for chemicals. They used to treat diseases with chemicals, you know—and with surgery, too."

"Surgery. Isn't that *cutting*—"

"Right. Cutting people open. Before it was outlawed, they were allowed to do that. I hope he's not proposing it here."

The white-coated man was being mobbed with people, shouting out their problems. He had been joined by half a dozen acolytes, who were beginning to hand out phials and packages. Sylvia opened the door of her cubicle and stepped out. "I have to tell Cinnabar Baker about this. We can't allow it."

"No." Bey came out quickly to grab her sleeve and restrain her. "First we get samples, have them analyzed. I'll bet they're totally harmless. Come on."

They had not finished eating, but the food and drink had been enough to produce another mood change. Bey was getting a little sleepy, and extremely cheerful. He began to make his way toward the center of the crowd. Sylvia caught up with him and pushed in front. "Not you. I'll do it. I can move easier than you. You stay right there."

She eeled into the mass of people, and returned a couple of minutes later with a bottle in one hand and a packet in the other. She held them up triumphantly, but just before she reached Bey she halted and her expression changed. She was looking right past him.

"Here comes your real test." She leaned close and spoke rapidly. "If you pass this one, you're home free."

Bey slowly turned. Heading towards them across the room was a smiling woman dressed in a cloudy dress of flaming pink. "Sylvia! I had no idea you were here."

"I just arrived." Sylvia squeezed the woman's hands in both of hers, then stepped back. "Andromeda, this is Behrooz. He's also visiting the harvester. Bey, this is an old friend of mine, Andromeda Diconis. We studied optimal control theory together, many years ago."

"Too many. But Sylvia was always better at it than I was. That's why I'm here, in my boring little job, while Sylvia roves the System." The woman had taken Bey by the hand, and was giving him a head-to-toe stare. Her glittering blue eyes and full mouth held an odd and unreadable expression. "Very nice clothes you have—you *both* have. Perfectly matched. What are you doing here?"

"Behrooz works on communications equipment," said Sylvia, before Bey could speak. "He's an expert on it."

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"We can certainly use some of those here. Where are you from, Behrooz?"

"The Opik Harvester."

"Ah. Such a dull place—I would never want to live there. And you are a communications *expert?* How impressive." Andromeda Diconis was still holding Bey's hand, but it was Sylvia that she spoke to next. "I'm sure he is an expert on many things. But my dear Sylvia, whatever happened to your other friend? What was his name, Paul?"

"Paul Chu. I suppose you didn't hear. He disappeared on a mission to the Halo."

"Oh, yes, now you mention it I did hear that. But I thought he came back. Someone here said they'd seen him, just a week or two ago. Anyway, we don't want to talk about *him,* do we?" Andromeda finally released Bey's hand and reached up to straighten his collar. Her fingers ran over the hollow of his throat. "Not when you've been able to make new friends, Sylvia. And very attractive friends, too. I'll tell you what, I'm going to stay here and have something to eat. Would you and Behrooz—" Bey earned a dazzling smile "—like to wait for me, and then we can all go to the concert along the corridor?"

Sylvia placed her hand firmly on Bey's arm. "Not today. We've just eaten, and Bey has had a very hard day. He needs to rest now."

"I'm sure he does. I'm sure you *both* do. But it's wonderful to see you again, Sylvia, and I'll call you tomorrow." She reached forward and stroked Bey's forearm. "And I really look forward to seeing you again, Behrooz. Once you're properly *rested.*"

Bey tried to smile and nod, but Sylvia was already towing him off towards the exit. He waved to Andromeda Diconis, and received a blown kiss in return.

"What's the hurry?" he said, as soon as they were out of earshot. "Was I making her suspicious?"

"Not in the slightest." Sylvia's manner was a mixture of pleasure and irritation. "You passed perfectly. Couldn't you tell? She'd never have acted that way if she thought for one moment that you were from the Inner System. She's the perfect Cloudlander, looks down on everything inside the Kernel Ring. But Andromeda was all ready to eat you for breakfast."

"If I was passing perfectly, why drag me away?" Bey rather liked the idea of being eaten for breakfast by Andromeda.

"Because Andromeda has to think that I'm jealous—the way she would be. She thinks she understands our relationship exactly, and that's the best thing that could have happened. Andromeda's a total bitch, but she took you at face value, as a Cloudlander. And she's the universe's greatest gossip. Give her a day or two, and everyone will know that I have a new companion, a man from the Opik Harvester."

"Isn't that dangerous? They may want to meet me."

"She'll tell people that I'm jealous of you, and want to keep you all to myself. It's a perfect reason to let us stay private while you work. But that's something we'll worry about tomorrow."

"Uh-uh." He yawned. "Tomorrow, and tomorrow, and tomorrow. Great word. Great speech. Hmmm."

Sylvia had noticed the change in Bey

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since leaving Andromeda Diconis. Another common aftereffect of a long session in the tanks was hitting him. He was on a high, but fast running out of adrenalin and energy. The surprise of waking in a strangely different form and the stimulus of the new surroundings had been enough to give him a lift for the past few hours, but that was fading.

"Come on. Before you fall asleep in the corridors." It had been a convenient excuse to leave Andromeda, but it was true enough. Bey Wolf would need a good rest before he was fit to work on the Marsden Harvester's form-change problems.

She led him away towards his assigned quarters. Bey didn't speak, and by the time they arrived his eyes were closing. Sylvia steered him to a bunk. He was asleep before she could add another word. After a few moments she gently removed the bright blue clothes and the extravagant hat, and secured him in the bunk with loose straps. He would become used to low-gee sleeping soon enough, but he might be disoriented when he first woke.

He lay flat on his back. Sylvia looked over the sleeping body with approval. "Pretty good job I did with you, Behrooz Wolf, if I say it myself. Andromeda was fascinated, and she's a connoisseur. 'Very attractive friends,' eh? We'll have to fight to keep her away from you."

Sylvia frowned, remembering another of Andromeda's comments. Someone on this harvester had seen Paul Chu, recently. Even if it were no more than a bit of gossip, Sylvia needed to follow up on it. Cinnabar Baker had pointed out the problem. When you talked of war and sabotage, all roads seemed to lead to the Kernel Ring; but no roads led to Black Ransome, or to Ransome's Hole. Unless she could track the lead to Paul, and he could provide the pathway.

She started for the door, then paused. She mustn't go back to the hall too soon. Andromeda had her own ideas about what Sylvia and Bey were doing at the moment, and Sylvia wanted to keep that idea intact.

She forced herself to wait for almost two hours, thinking hard and watching the steady rise and fall of Bey's bony chest; at last she headed for the concert hall.

The lights had dimmed automatically. Bey lay in darkness, listened to the faint hissing of the air ventilators, and wondered what had wakened him. He was almost in free-fall, floating with only the imperceptible tether of a pair of retaining straps. And he was not ready to wake. He felt groggy with sleep, so tired that it was an impossible effort to open his eyes.

"Bey!" The voice came again. It was no more than a whisper, but it jerked him at once to thrilling wakefulness. It was a sound to rouse Bey from the dead.

He opened his eyes. The projection system in the corner had switched itself on, and revealed the interior of a dark room. In the center of that open space, her face illuminated by the faint gleam of a single red spotlight, sat Mary Walton.

"Bey!" The soft call came again.

"Mary. Where are you?"

"Don't try to answer me, Bey. This message was pre-recorded, so I can't

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hear what you're saying. It is triggered when you respond to your name and open your eyes."

She was as hauntingly attractive and as crazy-looking as ever. Bey even recognized her outfit. It was the one she had worn when she played Titania, a long, russet gown that should have been dowdy but which glowed with fairy tints of warm light. He had last seen it locked in a closet of his Earth apartment. Her voice was even more familiar, as wonderful as ever, the smoky, husky tones that made Bey hear sexual overtones even in her comic speeches.

"I don't want you hurt, Bey," she went on. "I've already saved you many times, back on Earth and on the Space Farm; but I don't know how many more times I can do it. You have to stop what you're doing, leave the harvesters, get back to Earth."

"How did you know where I am?" Bey responded automatically, forgetting that she could not hear him.

"You are being used, you know, by the Outer System." She had not paused. "It's not your problem, but they'll try and make it yours. The Outer System is going to break down, more and more, and if you try to stop it, it will kill you. Say no to Cinnabar Baker, whatever she suggests. When Sylvia Fernald tries to sleep with you—she will, if she hasn't already—remember that she's doing it as part of her job. You are nothing to those people." Mary raised her hand. On her middle finger glowed a huge kernel ruby, the rarest gemstone in the System. "It may be over between us, Bey, but don't ever forget that I'm fond of you. I saved you, when the messages were making all the others die or go mad. Give me credit for that. Goodbye now, and please take care. Sleep well."

She waved. The projection unit's image slowly faded, until after twenty seconds Bey could see nothing but the ghostly glimmer of the kernel ruby. Finally, that too was gone. The sleeping chamber was again in perfect darkness.

Bey was sweating hard, and his heart was pounding. He was filled with a mixture of excitement and amazement. Mary's final words had been a grim joke—he would not sleep now, not for hours. He loosened the straps that had held him snugly in position and walked across to the projection unit. It should hold a recorded copy of that whole message.

The recording storage was completely blank. Naturally. Bey was not even surprised any more. After the Negentropic Man, after the projected images that were filling the Outer System, and Mary's ability to leave a message for him wherever she apparently chose, no other anomaly of the communications system could be ruled out. It was all impossible.

But one impossibility throbbed in his head harder and harder, the longer he thought about it. If Mary knew where he was, then perhaps she could find a way to send a message; but *how,* in a total region of space so large that the whole Inner System was no more than a dot at its center, did she *know where he was?*

She had known of his trip to the Sagdeyev Space Farm. She had learned of his return. She had tracked him to these quarters within a few hours of his arrival there. How? How did she know?

He would *never* get to sleep. *Never,*

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never, never, never, never. With that single word resounding in his head, he went drifting irresistibly toward the slumber of total exhaustion.

And it was in those final moments, swimming down towards new unconsciousness, that Bey had a first inkling as to how Mary knew what was happening so quickly. He tried to catch the thought, to study it, but it was too late.

He was asleep.

CONTINUED IN NEXT ISSUE

ROBERT A. HEINLEIN

1907-1988

Robert Anson Heinlein, surely one of the most important and influential writers ever to work in this field, died peacefully in his sleep on May 8, 1988. He was born July 7, 1907, in Butler, Missouri, and graduated from the United States Naval Academy at Annapolis in 1929. He served as a naval officer until he was forced to retire because of physical disability in 1934. His first science fiction story, "Lifeline," which appeared in the August 1939 issue of *Astounding,* launched a career which continued in full force until his death. During the 1940s a great many of his stories appeared here, some of them under the pseudonym Anson MacDonald and many of them linked into a sweeping "Future History" (some parts of which uncannily parallel things which have actually come to pass). After 1950 he wrote little short fiction but many widely acclaimed, memorable, and thought-provoking novels. Four of the (*Double Star, Starship Troopers, Stranger in a Strange Land,* and *The Moon Is a Harsh Mistress*) won Hugo awards. Heinlein was Guest of Honor at three World Science Fiction Conventions over a 35-year period, and in 1975 received a Grand Master Nebula Award.

He is survived by his wife, Virginia, and by several million readers for whom he provided a wealth of both entertainment and inspiration. Many of us literally grew up with his juvenile books and into his adult ones. We will not forget them or the man who wrote them.

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the reference library

By Tom Easton

Ivory: A Legend of Past and Future, Mike Resnick, TOR, $?, ? pp.
Fang, the Gnome, Michael Greatrex Coney, NAL, $17.95, 346 pp.
Alqua Dreams, Rachel Pollack, Franklin Watts, $16.95, 246 pp.
The Gold Coast, Kim Stanley Robinson, TOR, $17.95, 441 pp.
2061: Odyssey Three, Arthur C. Clarke, Ballantine/Del Rey, $17.95, xiv + 281 pp.
Red Prophet, Orson Scott Card, TOR, $17.95, 311 pp.
Starfire, Paul Preuss, TOR, $17.95, 310 pp.
Myth-Nomers and Im-Pervections, Robert Asprin, Donning, $7.95, 190 pp.
Synergy: New Science Fiction, Volume One, George Zebrowski, ed., Harcourt Brace Jovanovich, $5.95, xx + 243 pp.

Mike Resnick loves the wild and woolly—the American frontier, the carny sideshows, bordellos, the Africa of colonialists and white hunters. The common threads in each case are the long nose down which the haves look at the have-nots, exploitation, the charm of the raffish, and the higher uses to which Mike each time puts his material.

Mike has toured Africa and been mightily impressed by the wildlife, the people, the scenery; he says he will return again. He has also learned of the Kilimanjaro Elephant, greatest of all land mammals, whose tusks weighed over 200 pounds apiece. It was killed, no one knows how or by whom, in the 1890s, and in 1932 its tusks found their way to the basement of the British Museum in London, where they have languished ever since, unexhibited, unwitnessed, unmarvelled at.

Trust Mike to find a moral in this tale, and to make of that moral a marvelously satisfying SF novel. Some six *millennia* from now, Duncan Rojas, head researcher for a firm that authenticates big game records, is engaged by Bukoba Mandaka, the last Maasai, to find the ivory. Why? Mandaka will not say, but

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he will pay enormous sums for the tusks. And Rojas is a man who loves a puzzle, obsessively, to the exclusion of all else in life. He is the ultimate tech-oriented man, all numbers and measurements. Mandaka is the ultimate romantic, all soul, and the growing relationship of the two is a parable for our times.

That relationship develops as Rojas tracks the ivory back and forth through time, always in central roles, in card games, wars, and rivalries, until its final dusty mislabelling that permits the hunt to succeed. Along the way, alternating vignettes from the ivory's history with views of Rojas's efforts and his interactions with Mandaka, Mike misleads the reader into thinking that in some way the ivory represents the soul of the Maasai people, for its loss coincided with the Maasai's loss of power in their world. But the truth is something else, with its roots in one man's violation of his cultural integrity, his honor. Such violations, says Mike, can echo down the ages, to end only when someone accepts the debt of destiny and reconciles the warring natures of humanity (technical and romantic). Unfortunately, he adds, the reconciliation has no hope of permanence, for people are obstinate beasts, and if they change their stripes, the change is only momentary.

Mike is also talking about the relationship of humans with the natural world, as represented by its wildlife, especially its big game. The Earth of Rojas's time is bare of everything larger than a bug or mouse, except for people (and most of those have left for the stars). Rojas's firm has chronicled the extinction of everything that humans might have killed for sport or crowded aside in their selfishness, giving humans an unmentioned debt of honor as great as anything the last Maasai could possibly bear. Sadly, our species has no hope of an atonement as romantic as the futile gesture Mandaka feels obliged to make, and certainly no hope of an objective atonement such as might satisfy the technical soul of such as Rojas. The best our kind can do is to struggle on.

A definite "Don't miss!" And yes, I do think it has a shot at the major awards.

Michael Greatrex Coney has finally written a book to fit his middle name (which I love). In **Fang, the Gnome** Greatrex meets the Great King, Arthur Himself. But the book is no fantasy, despite its title, nor a historical novel. Rather, it fits right into Coney's future history scheme of greataways and ifalongs and happentracks and Starquin the Five-in-One. One of Starquin's Dedos (parthenogenetic women who guard the stones that serve as travelers' relays throughout the greataway), resident in what may be our past, has examined the happentracks to forecast Starquin's eventual death. To prevent it, this Avalona (whose son/husband/sidekick's name just happens to be Merlin) takes a village girl, Nyneve, for training. She teaches her to dream, and then to tell stories that reflect the dreams. She shapes the dreams, and hence the stories, and then, she hopes, the minds of future generations of humans.

The world of Avalona and Nyneve is reality, plain, crass, pragmatic. The world of the stories is noble and idealistic. It is the world of Arthur, known to us from stories passed down for centuries and, says Coney, originating in Nyneve's manipulated dreams. The stories she told, you see, gripped the minds of her audience. The ideas she introduced to her world—chivalry, for one—stuck; and ever since, humanity has guided its collective behavior with

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high ideals. Avalona's hope seems to be that humanity, under such guidance, will in due time render itself incapable of threatening Starquin.

Where does the gnome come in? Two happentracks lie close together in Nyneve's place and time, and one can sometimes see across the barrier. That is a human can sometimes see the gnomes that occupy the other world, and the gnomes can see the giants in ours. Under the right circumstances, one can even cross from happentrack to happentrack.

Fang is one of the gnomes, and an abnormal fellow he is. Neé Will, he trapped a weasel, killed it, and thereby earned his sobriquet. He is active, inquisitive, and change-embracing, where his fellows are timid, retiring, and conservative. He is among the gnomes who learns to follow Nyneve to her home happentrack, and when he learns the happentracks are merging, he becomes a leader. The book is as much his, the tale of the confrontation of two cultures, gnome and human, as it is Nyneve's, or Arthur's.

Is Arthur history, fiction, or myth? Coney's point has a lot to do with the impact that dreamers can have on their world, sometimes to their surprise. The ifalong is infinite, happentracks can merge, and truth depends on viewpoint, or happentrack, or time.

Rachel Pollack's first novel, **Alqua Dreams**, has a simple enough surface, or plot—human visits alien world to negotiate exploitation contract, finds native customs bizarre, and fails—but a complex, difficult subtext of epistemological puzzling. If the whole does not entirely succeed, it is because Pollack has run into the same problem as many other would-be epistemologists: mysticism and gnosticism—knowing by intuition or revelation, learning by osmosis—sound good, but they don't work.

The human is Jaimi Cooper. He is a planet rep for the Company. His job is to visit planets and bargain their natives out of their supply of rhovium—an intelligent, telekinetic crystal essential to interstellar travel; it is apparently found only on worlds with sentient life, and there is only one deposit per world. His sister and lover live in a comet-rooted Dyson tree back in Earth's solar system; they have rejected high-tech life in favor of a more mystical, intuitive approach to the universe (Pollack is aware of the paradox).

The alien world is Keela. The natives, the Lukai, live in an abandoned city whose machines provide them with food, clothing, and gimcracks and whose library contains telepathic books that, perhaps as might really be (once you swallow the telepathy), give each "reader" a different message, depending on what their head contains already. The Lukai believe they are dead, the victims of a prank by a god with a nasty sense of humor. If they think they are alive, that is because their god is fooling their souls. Therefore Jaimi is really dead too, and he cannot offer them anything worthwhile in return for their rhovium. Rhovium, deals, life, death, all is illusion. Nothing matters.

Want to baffle your friends and family? Try this belief system on for size. It's as unbreakable as the standard alternative! In our society, trying it out might earn you a sojourn in the wraparound white coat, but on Keela, it's consensus reality. Jaimi cannot penetrate it, except briefly and shallowly—until the high priestess, the Death Woman, reveals her own apostasy and reveals where the Lukai are coming from. To them, much more than to

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Jaimi's kin back home, reality is malleable. Delusion and hallucination and death seem indeed the best interpretations of reality.

The rhovium is irrelevant baffle-gab. If Pollack had left that out entirely, using as the object of the treaty simple *lebensraum*, she would have had a purer, and therefore better, game of philosophical what-if.

It had to happen. "Alternate world" stories offer us pasts, presents, or futures that refuse to match up with the realities we know. Their premise is, "What if something were or had been different?" "What if Washington had fought the Battle of Waterloo?" "What if Nelson had been a Confederate general?" "What if . . . ?" Philip José Farmer has even asked, "What if the pulp stories—Tarzan, Doc Savage, etc.—were true?"

We even have the idea of alternate fictions, as in Heinlein's works. And now we have Kim Stanley Robinson, who painted for us a survival-in-the-ruins picture of California in *The Wild Shore*. Now he asks, "What if things turn out rather better?" and comes up with the urban utopia (sic) of **The Gold Coast**. Neither book is an alternate world story in the usual sense, for their time is a century in our future. But each represents an alternate world in relation to the other (as well as to every other writer's work, but that doesn't count).

The setting is Orange County. That is, we're talking wall-to-wall condos; freeways that come in layers; malls one need never leave; designer drugs as big, if clandestine, business; a defense industry gone berserk.

You say that sounds rather current, not futuristic at all? Well, bubby, that's the point. Robinson has taken present patterns and exaggerated them for the sake of commentary on the excesses of civilization. His hero is Jim McPherson, a poet manqué who hangs around with the local druggies—among whom we can count ambulance driver Abe Bernard, who finds sanity not in reality—and works at a variety of part-time jobs while aggravating his weapon-designing dad no end. The story is of Jim's realization that he really must get his act together, that there is a reality more valid than drugs, cruising, and sabotaging weapons factories, that Orange County has a history, and that the area's "development" is a saga of exploitation, of loss.

What can a poet, manqué or otherwise, do? Robinson's answer is that the poet must embrace reality. He must realize that the exploiters of the defense industry, and by extension of Orange County history, are each doing the best they can to improve or save their world. He must commit himself, to the system, to love, to life. *L'chayim!*

Some say all novels have strong autobiographical elements. A few add that no one has any business trying to identify those elements. But I am going to indulge the temptation to wonder to what extent Jim McPherson is Kim Robinson. It helps that Robinson seems to be saying, aside, "Look, my character is a poet. But you know that *I* had to write his poems for him. So I'm the one who is really a poet. But I'm not sure my stuff is any good. So I'm calling Jim a bad poet. But here's some of his poetry. If it's not so bad, *please* let me know."

Frankly, the poems Robinson scatters throughout the book strike me as self-indulgent, navel-mired twaddle. Now, this may mean Robinson is a superlative poet, having created poetry to fit a twaddling character, but writers have been passing their verse in novels for cen-

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turies, and I am suspicious. I would rather think of Robinson as the novelist he is, read his "poet" as "artist," and think that the maturation of Jim McPherson is a process that Kim Robinson has gone through himself.

Oh, yes, make that "excellent novelist." *The Gold Coast* is a marvelous integration of technology and life. Automated highways mean people "track" not "drive." Elevated pavements put the poor in the shadows of progress. Terrorists get better results through chemistry. The defense industry, still struggling to make the Strategic Defense Initiative work, is run by and for political animals. And the defense industry, the drug trade, Orange County development history, the poor, the rich, the terrorists, and all the rest come together very neatly at the end.

And Robinson's characters, even minor ones, live. He only rarely commits the sin of stereotypy, perhaps because he loves all the people of his story. Because he cares, so do we, and this is the secret for which other writers must wish to kill.

Arthur C. Clarke keeps on truckin'. Now he gives us **2061: Odyssey Three** as—of course—a sequel to *2001: A Space Odyssey* and *2010: Odyssey Two*. And there seems likely to be another sequel, though it will probably be set sometime in the 3000s (at least, this one's final segment is dated 3001).

What's happening in 2061? Technology has advanced, and the spaceships of the time are downright luxurious, with no hibernation necessary and stewards to tend the passengers' cabins. So learns Heywood Floyd, centenarian survivor of the previous books, when he is invited to come along on a trip to Halley's Comet. Meanwhile, an astronomer on Ganymede has noticed a surprising feature of a mountain on Europa. Unfortunately, I was not a bit surprised when the astronomer leaked word to certain quarters and started things moving toward a violation of the "No Trespassing" sign posted on Europa by the monoliths. (I had made the mistake of reading the acknowledgements page at the back of the book before reading the story itself. One clue I found there let me realize what the mountain was almost as soon as it was mentioned, and that was enough to make the rest of the story pretty predictable.) A ship is forced to crash on Europa, bearing both the astronomer who started it all and Heywood Floyd's grandson. The ship Heywood is on refuels from Halley's vented waters and takes off on a rescue mission, while Floyd Junior explores Europa, sees wonders, and garners clues to the nature of the life evolving —rapidly!—there.

Sadly, the villains remain offstage and nothing is resolved. The main excuse for the book is to revisit old haunts and to present the latest in space observations (Halley) as a Grand Tour of selected parts of the Solar System. The thin plot is there simply to keep things moving. Neither it nor the few new ideas Clarke offers here are enough to bring the book up to the level of his past efforts.

Need it meet that standard? If it pretended to stand alone, yes. But it does not stand alone. To appreciate it fully requires some familiarity with its prequels. And there is what will make it a bestseller. A great many people loved the prequels, and many of them will insist on finding out what is happening with the monoliths, with Europa, with the unified-world future Clarke envisions. It will satisfy that yearning, though it is not strong enough on its own to initiate such popularity.

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* * *

Orson Scott Card began a new phase of his career with *Seventh Son*, which I reviewed here last December. Now he gives us **Red Prophet** as volume 2 in the Tale of Alvin Maker, and it is as marvelous as the first. If you miss this series, you will forever be consigned to the Outer Darkness of the culturally illiterate. Worse yet, you will miss an experience that will bring joy and warmth to your heart, pain to your soul, and breadth to your sense of the world.

Go ahead. Accuse me of hyperbole. I confess cheerfully. And I repeat: The Tale of Alvin Maker is a major work. If it accepts the convention that the White Man is the enemy of nature and the Red Man its friend and partner, it is to examine the ways in which human beings live within the world and ultimately to redefine the convention by showing that one can find a middle way. Race is not the factor that defines one's attitude toward nature; rather, it is one's loyalty to Maker or Unmaker, to the whole or to self.

In *Seventh Son*, Card introduced his vision of an alternate America, one where the United States are only one small outgrowth of the original colonies and where the people have magical talents—knacks—with which to make life easier. In this context is born Alvin, a child who has the supreme knack of making reality rush to do his bidding, a child whom the Unmaker hates and to whom all running water is mortal foe. He lives in the Wobbish Territory (roughly our Indiana). To the south and east lies the settlement of Carthage, run by the arrogant, self-serving White Murderer Harrison. Red Indians roam the forest, and a Red Prophet, preaching nonviolence, has established a city across the river from Alvin's town. Harrison hates Reds and envies Vigor Church for its greater likelihood of becoming the eventual state capitol. He wants that role for Carthage City and the governorship for himself. To that end, he conspires with other villains to induce "tame" Reds to kidnap and torture Vigor Church children, to rouse enmity against the Reds, and to get the Vigor Church people to invite him and his troops to pacify the land. He will then tyrannize those gentler people and assure his dominance.

But the kidnapped children are Alvin and his brother Measure. Alvin uses his talent to ensure their survival until they are rescued by friendlier Reds. Unfortunately, these Reds do not send them home. Instead, they take the boys to meet the Prophet, who they learn has a vision that requires their absence, Harrison's success, and the slaughter of thousands. The end result will be the separation of the dead White lands and the living Red lands by the Mississippi.

I leave out so much, but the essential question here is what can Alvin, or anyone else, do? He can be true to himself and his talent. He can learn his powers. He can heal. He can prove the possibility of a White soul and a Red soul in one body. At the same time, the people around him must learn to accept responsibility for their sins.

To me, the splitting of the land seems a triumph of the Unmaker. Alvin, if he is to live up to his name, must somehow reverse the prophecies of the Red Prophet and unify the land, the Whites and Reds, just as he unifies their soul within himself. But how he will do this—how Card will have him do it—is beyond my foresight. I suspect it will take more than one more volume. It may take a dozen.

Some time ago, Paul Preuss and special effects director Gary Gutierrez began to develop "a realistic, documentary-

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style film about a future space mission." However, it became clear the film would be impractically expensive. Preuss writes, "With Gary's blessing I've turned our ideas into this novel, which owes much to Gary's originality and hard work . . ."

So much for background. The novel is **Starfire**, and it shows its cinematic origins perhaps too strongly, beginning when the hero shows his "right stuff" by becoming the first to ride an ablative escape capsule from orbit to ground. He's trying to escape a radiation storm that would not kill him but would exceed his lifetime radiation limits and thereby bar him from future space missions. But he is barred anyway, for he has demonstrated that he is a reckless jerk.

Fortunately for him, he has a powerful Texas family. When the new-model spaceship, the fusion-powered *Starfire*, comes on line, strings are pulled. His interest in asteroids leads to an addition to a Starfire mission, to let it land on and survey an asteroid that will pass very near the sun. Unfortunately, things go wrong and the *Starfire* and its crew must accompany the asteroid around the sun. Survival is assured only when Our Hero, having learned that it is best to cover one's ass, comes up with a bright idea for avoiding the storm of radiation, this time far more deadly, they must traverse. The book's cover art offers an important clue to the nature of the gimmick.

There is somewhat more to the story than this, for Travis Hill eventually learns a little about how to be less of a jerk. But most of the characters seem little more than big-screen cardboard. It is EVENT—crisis, disaster, heroism—and MARVEL—the secret at the core of the asteroid, the answer to crisis—that dominate the story. And the whole, despite a prolonged build-up, works fairly effectively. Preuss has written a highly visual, highly dramatic tale that will satisfy a great many people. Furthermore, in defiance of modern trends and much to his credit, he has done it without a single murder.

And here's the godhelpus-and-third of Robert Asprin's myth adventures: **Myth-Nomers and Im-Pervections**. Skeeve travels to Perv, land of demonic appearances, the *reductio ad absurdum* of Big City American commerce, in search of his vanished partner, the Pervert—er, that's Per*vect*—Aahz. We get more of Asprin's half witty slapstick, of which a shot or two was nice but a surfeit is a barfeit.

There is an encouraging sign in this one that Asprin may himself be growing weary of Skeeve's juvenility. He has him agonizing about growing up, maturing, taking responsibility, and so on. With luck, the humor will also mature. Then, perhaps, the humor will be over the heads of Asprin's fans, they will stop buying the endless flow of Myth books, and Asprin will move on to something else. But I doubt the world could be *that* lucky.

The first of SF's latest original anthology series, edited by George Zebrowski, is now available. It's the twice-yearly **Synergy: New Science Fiction**, and Volume One is readable but thin. A couple of the stories are excellent—I think of Ian Watson's "Jewels in an Angel's Wing," which concerns a number of people trapped in what seems to be a multi-level video-game and their discovery of what reality that seeming hides; or of Charles L. Harness's "Signals," whose characters find themselves listening in as colossal alien ships, lost among the galaxies, prepare

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to call for help by firing three shots. W. Warren Wagar's "Madonna of the Red Sun" comes close to excellence, for it shows a nifty imagination, focusing on the end of time, when humans are no more than bundles of nerves, perfect humans have fled the death of the sun, flawed children cower on Earth with their caretaker, and that caretaker strives for a life-saving prosthesis. The flaw is that everything comes together so neatly and easily at the end that one's suspension of disbelief shatters a moment too soon.

But then the thinness takes over. Greg Benford's poem, "Bleak Velocities," is both *too* bleak and uncertain of its focus. James Morrow's "Veritas," concerning the illegalization of clichés, is a tad hackneyed itself. Fred Pohl's "My Life as a Born-Again Pig" is clever but minor. Rudy Rucker's "Inside Out" exists for the main purpose of showing how to turn a cat inside out and for the minor purpose of showing how complicated being possessed by miniature aliens can make one's life.

Unfortunately, I do not see the readers flocking to the *Synergy* banner. It has only the seven stories, plus an introduction on synergists and a wittily entertaining end-of-book essay (originally a speech), "What Should an SF Novel Be About?" by Brian Aldiss. That's all. In a standard-sized paperback with wide margins and moderately large type. For almost twice the price of a normal paperback. It does not comfort me to recognize that the paper is of a slightly better grade than we are used to seeing except in hardbounds. And I sadly forecast that the combination of skimpy content and high price will soon kill the series. ■

ON GAMING

(continued from page 63)

can help in deciding whether to trade with them or arm the laser cannons.

One of the most impressive things about *Starflight* is how it looks. As you land on the worlds they appear as checkerboard grids, with all the terrain and elevation very clear. Contacting an alien brings its image to your ship's viewscreen, and you get to look at the bug-eyed monster as you haggle over the price for Tholium Ore. A full schematic of the ship can be accessed to check for damage, and the star charts clearly show the type of star, and the surface (from molten to gas) of any planets.

A similar, if much more modest game, has appeared from an unlikely source. *Star Voyager* (AKKLAIM Entertainment, Inc., 189 South Street, Oyster Bay, NY 11771) is a game cartridge for the Nintendo Entertainmen System (N.E.S.)—the hottest selling electronic or toy product last year.

Nintendo has nearly three dozen li censees all wanting to jump on the sec ond wave of the video bandwagon. *Sta. Voyager* is one of the licensed games and it's a bit unusual.

Using the Nintendo controller, play ers can access a number of view screens put up shields on their ship, check thei life support system, radar, and speed A star map can also be brought int view, a course plotted, and fuel need calculated.

While not nearly the simulation tha *Starflight* is, *Star Voyager,* for a game system used to jumping and blasting. makes sophisticated use of the powerfu Nintendo game machine. ■

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brass tacks

Dear Mr. Schmidt:

Your treatment of the issue of competition versus monopoly in the January editorial "Matters of Principle," though it is better than most economic "analysis" appearing in the popular press, still leaves much to be desired.

The central economic question you raise is whether the principle of "competition is better than monopoly," is always true, and you raise the break-up of "Ma Bell" and the deregulation of the airlines as evidence to the contrary.

I must disagree. The central effect of the deregulation of airline entry and pricing has been exactly that which economists predicted—more airlines offering more flights at cheaper prices with a resulting massive increase in the number of people using airlines. Because price competition is now allowed, airlines have also had to adopt different policies to ensure their profitability, including putting more seats within planes (making travel "less comfortable"). But again, that was a predicted consequence of deregulation.

The more serious question you raise is whether deregulation has made air travel *less* safe. While you note that no evidence of safety being seriously compromised exists, you (like many others) worry that there is an incentive for airlines to cut costs by cutting equipment maintenance in order to stay competitive. You also worry about the proliferation of flights increasing delays and overburdening air traffic controllers.

Regarding the first worry, economic incentives are present to *not* cut equipment maintenance. Tort judgments of $1.5 million per passenger killed in air crashes make cutting costs on equipment an economically irrational policy to follow. Costs to airlines would be *larger*, not smaller, if equipment maintenance is cut. That airlines face market

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incentives to provide safety has been recently shown by Professor Andrew Chalk in a recent *Cato Institute* study.

On the second worry, I must point out that you are dealing with the major aspect of air travel which continues to be controlled by government regulation. Several articles in the past few years have noted that the FAA has dragged its feet in innovating and improving air traffic control and safety. Re flight delays—such delays typically occur in the early morning, noon, and early evening; such delays are infrequent at other times. The reason why is clear, as is the proper way to solve the problem. Delays occur because airlines wish to be competitive in flight schedules and thus bunch their flights at times consumers desire. The problem is that take-off and landing slots are a scarce resource, but are not being treated as such. A policy of renting take-off and landing slots to the highest bidder would solve this problem by spreading out flights over the day. However, such a competitive market solution has been consistently resisted by federal and local officials.

In reference to "Ma Bell," your major worries seem to be that customers need to choose which company to use (horrors!) and the longer (more complicated?) bills. You give little notice to the fact that long-distance rates have been *substantially* reduced (50% over the last four years), complaining that your overall phone bill (with higher local service charges) is unimpressively changed. The point should be clear: the portion of the industry where entry is now allowed and pricing is deregulated (long-distance) has produced benefits for consumers. The portion of the industry which remains regulated and where entry is still disallowed (local service) continues in its old monopolistic ways. No surprise here.

The principle that "competition is better than monopoly" remains justified, even in the case of airline deregulation and the "Ma Bell" break-up. To fully capture the gains from competition in these two industries, *more* deregulation should occur and proposals to re-regulate these industries should be assigned to the garbage can.

D. ALLEN DALTON
Center for Study of Market Alternatives
Caldwell, ID

Dear Stan,

An avid SF fan for 50 to 60 years, cutting my literary teeth on early *Amazing & Astounding* mags, most brought home by my older brother, a bigger fan. But I confess to more than a couple of times swiping *Astounding* off the mag. rack during depression years when two-bits was hard to come by—I still remain a fan and subscriber of yours for a couple dozen years or more.

It's all about your serials over the years. Most good, some very good (*Dune, Shuttle Down, The Integral Trees*, for instance) but the serial that finally generated this, my first letter to you, is Bujold's *Falling Free*. A creative tour-de-force that had me anxiously awaiting each month's episode like a "Perils of Pauline" Saturday afternoon movie serial.

I hope that Lois is busily working on a sequel (after all, that miserable Van Atta is not going to let it go, just like that!) and that you are planning to publish it as soon as she does.

Keep up the good work. Your stuff is as good as John D's. in my opinion—and I even understand *some* of the "Fact" pieces w/o an Engr. Deg.

ROBERT L. HOGAN
St. Augustine, FL

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Dear Mr. Schmidt:

Lois McMaster Bujold should collaborate with Larry Niven on a sequel to *Falling Free*: the quaddies are perfectly adapted to the free-fall environment of the Smoke Ring!

STUART-MORGAN VANCE
416 Sunset Drive,
West Jefferson, NC 28694

Dear Mr. Schmidt:

I've tried to like serials—God knows, I've tried. I just finished Bujold's *Falling Free*, in hope that I could adjust. I've tried to save all the issues and read the serials in the same way as I would read a book, but inevitably part two or (impossible situation) the final issue has disappeared. Reading them as they come out is even worse: try looking at a painting that comes to you torn into four quarters, one piece after another at four-week intervals. What would you do to a classical music radio station that presented a long symphony one movement at a time from week to week (let alone monthly)?

Most important of all, consider the slim market for short fiction, compared with the rows on rows of book-length science fiction found even in B. Dalton and Crown stores. Even with the resuscitation of *Weird Tales* (quality and longevity still pretty much unknown quantities), the amount of short fiction is pathetically small. This narrow window is also a medium for non-fiction articles, reviews, convention and gaming information, most of which does provide a valuable sort of contemporary contrast (maybe historical by print time).

While a case can be made for articles, the case for serials borders on the nonexistent. Not even considering the alternative markets, the artistic disruption of message, the sheer inconvenience, serials are usually inferior versions of books almost immediately available. As for their reputed ability to maintain sales and encourage subscription renewal, this might well be the case for a daily or weekly publication; *Analog* seeks renewals before only one or two issues remain, and has so many other values that serials don't figure.

In sum, give us a break—from serials of books we can buy elsewhere. Use the space to introduce us to new writers and to regale us with the work of established authors before their subscriptions to life are cancelled and you have to moan that there are no more stories in the pipeline. Maybe with a wider market, they would be able to spend more of their lives producing, rather than working for eating money.

DAVID MOODY
Glendale, CA

I'm sorry you don't like serials, and I sympathize with some of your reasons. However, please note . . .

I don't buy serials lightly; normally I only use them if I think they are of really special interest to our readers and/or may not be seen by them otherwise. In general, I will give preference to either a long or a short piece that does not *have a book contract over one that does. It's not true that all serials will soon appear as books; we've published several that were well received here but, for various reasons,* never *appeared elsewhere. On the other hand, occasionally a really outstanding book that does have a book contract comes in at a time when pickings are slim among short fiction, and I'd rather offer you a really outstanding novel than a bunch of substandard short pieces.*

As for serials being "usually inferior versions of books almost immediately available," that simply isn't true, at least at Analog. *With extremely rare*

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exceptions forced on us by special circumstances, an Analog *serialization of a novel is the* same *version you'd get in the book—except that we give you more illustrations.*

Dear Stan,

A short reply to John Charles Armor's letter in the February issue anent my "Safe to the Liberties of the People." First, an apology.

Yes, indeed, I erred in the number of states necessary to call a convention. He is correct. Thirty-four is the proper number. It was inadvertent as he suspects, and I did in fact, a few paragraphs earlier, quote the Constitution to the effect that, "on the application of *two thirds* of the states," which does yield the proper number.

Sorry.

On to the rest of it. I wish very much that Constitutional law and interpretation were as bound in stone as Mr. Armor seems to think it is. However, it just isn't so. I quoted the applicable passage of the Fifth Amendment. It is as it is, and no more. Alexander Hamilton, in referring to this passage, said in *The Federalist Papers*, "The words of this article are peremptory. The Congress '*shall* call a convention.' Nothing in this particular is left to the discretion of that body."

There is room here for interpretation.

Mr. Armor reveals a weakness in his argument when he mentions that the American Bar Association took his position in 1973—nearly two centuries after Article Five was written. One may legitimately presume that total agreement did not prevail over that time, nor, given the flexibilities of judicial appointment, that it might not prevail in the future. My story assumed it did not.

Moreover, the Constitution is not what the American Bar Association says it is—it is what the Supreme Court says it is. Perhaps a court of Robert Borks, "strict constructionists," would disagree with the American Bar Association. In reply to the argument that a body of precedent would support Armor's opinion, I recall Judge Bork stating in his hearings that a Justice has not only a right but a duty to overturn bad law.

Finally, it seems to me that Congressional urgency in the face of threatened Constitutional Conventions stems as much from the fear that *nobody really knows what might be the result of such conventions* as it does from anything else.

At any rate, I do agree with Mr. Armor on one thing: every American needs "to consider the importance of that ancient but modern document." And to consider the role we, as citizens, play in its preservation.

W. T. QUICK

Dear Dr. Schmidt;

I have been following your speculations on "private" or "internal" language with particular interest. As you and your readers must surely suspect, others have written about the same topic. Anyone wishing to delve further into the issue may find it useful to know that the academic disciplines which deal with inner language are called Neuropsychology, Neurolinguistics, Psycholinguistics, and Aphasiology; in addition, some work in Linguistics and Sociolinguistics is relevant, such as Bickerton's writings which you referred to. Some journals wherein these issues are often or occasionally discussed are *Neuropsychologia, Brain and Language, Cognition, The Behavioral and Brain Sciences*, and *Cortex*.

I have gone through about 300 years of published medical reports wherein medical doctors, working in what we

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would nowadays call the medical specializations of Neurology and/or Psychiatry, often offered their speculations on "inner language." The result of three centuries of such random ramblings? In 1980, a neuropsychologist asked in print, somewhat pointedly, "We all fervently believe that the corpus callosum transmits high-level information from one hemisphere (of the brain) to the other. Would anyone like to guess the properties of the language in which it does so?"[1] His question was subsequently met, essentially, with an embarrassed silence.

Far be it from me to suggest that one needs a Ph.D. in Psychology or Linguistics, or an M.D. specializing in Neurology or Psychiatry, to contribute meaningfully to the debate. Some hard-headed common sense from physicists, engineers, mathematical logicians, etc., would most likely provide a breath of fresh air, so to speak, besides novel perspectives.

I believe it is foresighted to be forearmed for a debate. Good luck in unearthing new ammo to those with the time, interest, and diligence for it.

TED PURCELL

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1. Marshall, J. 1980. The quote is from p. 127 of his article "On the Biology of Language Acquisition," pp. 106-148, in D. Caplan (Ed.) *Biological Studies of Mental Processes*. Cambridge: MIT Press. 1980.

Dear Stan,

Mr. Ray Van De Walker (Brass Tacks, February 1988) seems to have come up with an experiment that every rational human should fail—at least, in Mr. Van de Walker's eyes. With the dearth of information that he provided as the hypothetical reasoning arena, the only reply that any rational person could give to the question, "What would you do if you survived a nuclear war?" would be, "I don't know, whatever I had to!"

After 24 years of solving problems in the computer and telecommunications areas, I still feel that one of the best approaches to problem solving, hypothetical or real, is "I don't know, but let's find out!" (That last plural objective pronoun is deliberate. Problem ownership should remain with its appropriate keeper.)

Rational conclusions and actions should be the result of rational data gathering. In fact, it is rather irrational to expect a major, rational plan to erupt spontaneously from a vague supposition. Especially since the next nugget of information that you acquire may be the very item that will cause your elegant plan to swap itself inside out and catawampus.

I also agree with you that most people can learn a lot more that they think they can. The personal computer market would not have exploded as it has over the last few years if this was not so. I think that if I was a nuclear war survivor, then I would like to have many people around me that were open-minded and inquisitive, gradually building the group data that would be essential for survival. That "gradual time" might take hours, or millisecs, depending upon the circumstances.

I certainly would not want to ignore the tidbit that didn't fit into my great plan, since the Murphy probabilities are such that that would be the exact tidbit that would get me killed!

STEPHEN STOVALL

2380 Rocky Run
Charlottesville, VA 22901 ■

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a calendar of analog upcoming events

26-28 August
BUBONICON 20 (New Mexico SF conference) at Clarion Four Seasons Hotel, Albuquerque, N.M. Guest of Honor—John Smith, Artist Guest—Phil Hale, TM—Jack Speer. Registration—$15 until 1 August, $20 thereafter and at the door, $8 Friday, $12 Saturday, $8 Sunday. Info: Bubonicon 20, Box 37257, Albuquerque NM 87176. (505) 256-7161 10 am—midnight MST.

1-5 September 1988
NOLACON II (46th World Science Fiction Convention) at Sheraton Hotel & Towers, Marriott Hotel, Rivergate Convention Center, New Orleans, La. Guest of Honor—Donald A. Wollheim, Fan Guest of Honor—Roger Sims TM—Mike Resnick. Registration—$70 to 10 July, $100.00 at the door, Supporting —$30. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Nolacon II, 921 Canal Street #831, New Orleans LA 70112 (504) 525-6008.

9-11 September
COPERCON 8 (Arizona SF conference) at Phoenix, Ariz. Guest of Honor—Robert Vardeman, Fan Guest of Honor—Pat Mueller. Registration—$20 until 31 August, $25 at the door. Theme: Revenge of the Literates. Info: Coppercon 8, Box 11743, Phoenix AZ 85061.

22-25 September
Paris sur le Futur at La Maison de la Mutualite, Paris, France. Registration—F200 (attending), F120 (supporting). Info. Raymond Audemard, 118 Avenue de Stalingrad, F-92700 Colombes, France.

23-25 September
MOSCON X (Idaho SF conference) at Cavanaugh's Motor Inn, Moscow, Idaho. Guest of Honor—Anne McCaffrey, Artist Guests of Honor—Lela Dowling and Ken Macklin, Fan Guests of Honor—Ed & Norma Beauregard, Scientist Guest of Honor—Robert L. Forward. Registration—$22; Limited to 500 attendees. Info: Moscon X, Box 8521, Moscow ID 83843.

24 September
Conference on Middle Earth (COME) at Thruway Hosue, Albany, N.Y. Registration $50 (includes banquet). Info: COME, Jan Howard Finder, Box 428, Latham NY 12110.

30 September-2 October
CONTRADICTION 8 (Niagara Frontier area SF conference) at the Ramada Inn, Niagara Falls, N.Y. Guest of Honor—Frederik Pohl. Registration—$16 until 12 September. $20 thereafter and at the door. Info: Contradiction, Box 2043, Newmarket Station, Niagara Falls NY 14301.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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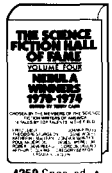

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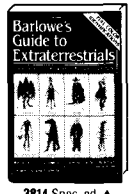

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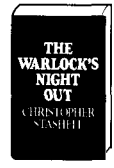

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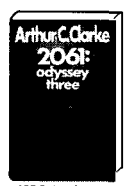

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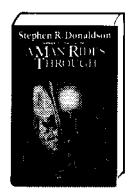

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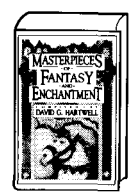

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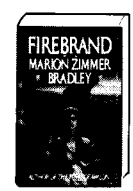

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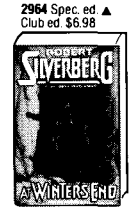

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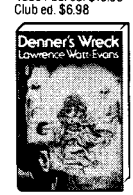

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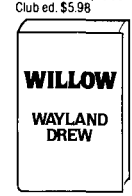

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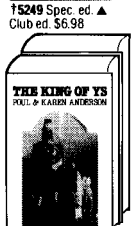

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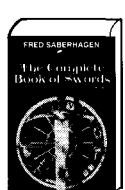

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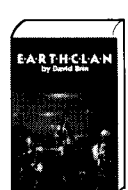

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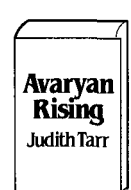

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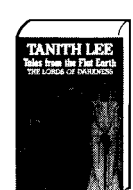

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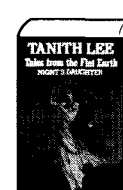

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